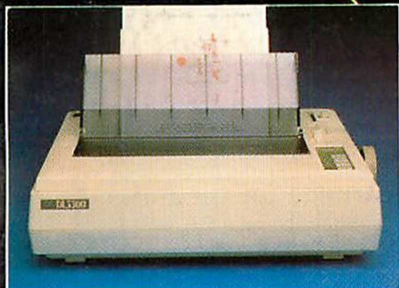
BBC · MASTER · ELECTRON · ARCHIMEDES NOVEMBER 1989 £1·50

BBC ACORN USER

A BETTER VIEW



Ultimate printer driver

READ ALL ABOUT IT
Poster designer

CHARACTER REFERENCE
Fonts explained

FAST AND FURIOUS
Arc Basic Compilers

EMULATING AUNTIE
The wanna-be Beebs

BIG BANG

On screen fireworks

BIG BANG





INTER DICTOR

"I HIT THEM AT FULL THROTTLE...

...The target in sight!

...NOW I'VE GOT TO BLAST MY WAY OUT"

It was getting hot, a couple of SAMS *(Surface to air missiles)* had taken out my escort. I'm on my own.

Going in low was my only chance, got to get under the radar cover. I banked right into the valley basin and started to follow the river, the target could only be minutes away.

BANG!!!

Explosion right in front of me, I yanked the stick hard right, I hadn't expected flak this low. I had to take out the *ack ack guns.* Weaving I flipped off the safety clip and squeezed the trigger.

All I could hear was the deafening roar of *30mm cannon fire,* I watched the tracer burn down to the ground and pop the ack ack like crackers. The bridge was getting closer, over or under? Over and radar would pick me up faster than I could say... Fast, Under and, well, I might not make it.

Some choice, I went under and... I made it, straight into a hail of cannonfire from an enemy patrol fighter, I pulled the stick all the way back, he couldn't match my climb, before he knew it I had dropped on his tail and seconds later two of my *air to air missiles* had ripped him apart... Eat that sucker.

They were throwing everything they had at me now, I was on top of them, I went in on full throttle, they didn't know what hit them.

Five full passes, sure, I got bruised, but nothing compared to the carnage on the ground. Spires of smoke, earthshattering explosions. I had pumped everything I had into them, now I had to blast my way out.

Interdictor is the ultimate in realistic flight simulations. Giving you total control of a high performance modern jet fighter.

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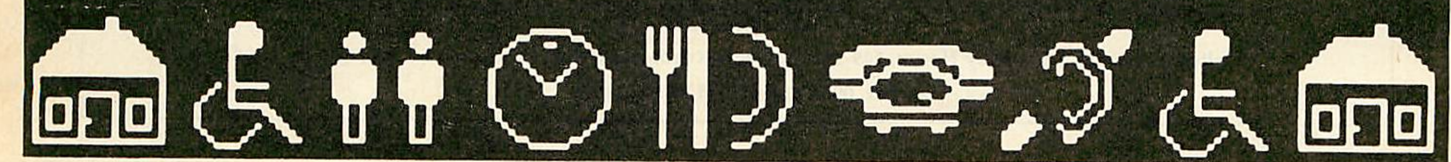
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BBC ACORN USER

ISSUE NO 88 — NOVEMBER 1989

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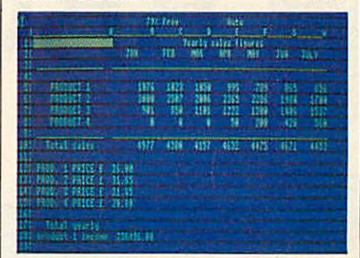
COVER FEATURE
Enjoy your very own fireworks display on the BBC micro or Archimedes

Cover illustration by Willie Ryan

FEATURES







REVIEWS



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Those who 'know' about computers will be surprised and impressed at the talent and the versatility demonstrated by the A3000.

With Acorn's own advanced RISC chip technology the new BBC A3000 is capable of executing four million instructions per second.

This outstanding performance is captured through the window driven RISC OS multi-tasking operating system.

With its friendly graphical interface the A3000 is also remarkably easy to use. In terms of memory the A3000 delivers 1 Mbyte of RAM with the facility to expand to 2 Mbytes.



There is also full compatibility with Archimedes 300 and 400 machines and by the use of emulators you have access to BBC B and, optionally, MS DOS packages.

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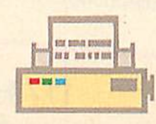
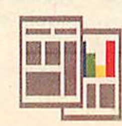
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NEWS

Show reports

Late Summer and Autumn have been busy times for Acorn, exhibiting at four shows in two months.

Acorn's stand located in the centre of the Personal Computer Show was the largest ever, with third party companies such as Beebug, Minerva and Computer Concepts demonstrating their wares.

The BBC A3000 and R410 Unix Workstation were on show together with the new floating point and SCSI expansion cards.



The Archimedes 400 series took centre stage on Acorn's stand at Milcomp 89. Westland System Assessment demonstrated Wift (Westland Indirect Fire Trainer) a package for instructing on artillery and mortar training.

Acorn also demonstrated its DTP package at the Desktop Publisher Show which was held in the London Arena between 4–6 October.

The Image Processing Show at Wembley (10–12 October) will see Acorn, together with a number of third party manufacturers demonstrating the graphical capabilities of the Archimedes 400 series.

Wild Vision will demonstrate its Genlock card and Hawk V10 image processing system which is aimed at scientific and industrial applications. A number of graphic based applications will also be demonstrated.

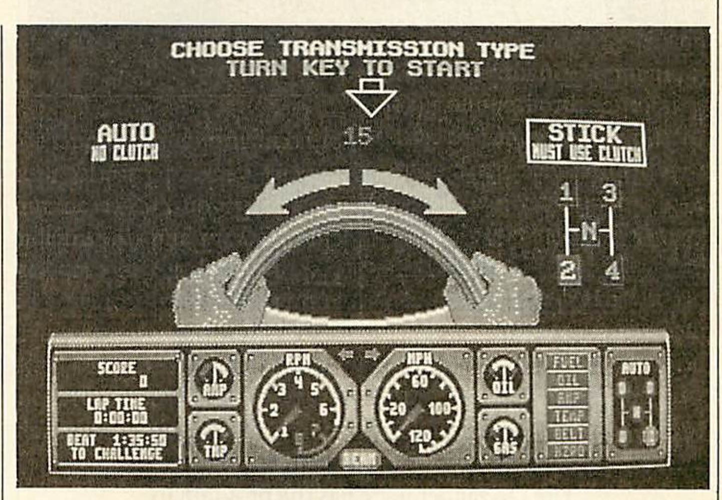
The games machine

The BBC A3000 looks set to take on the Commodore Amiga and Atari ST in the lucrative games market with the impending release of a host of mega games from major software companies.

To encourage games development for the A3000, Acorn held a conference in August attended by representatives from the top 30 software houses, including Ocean, Domark, US Gold, Grand Slam and Electronic Arts.

At the conference, Acorn executives briefed the delegates on the company's marketing strategy for the A3000 and revealed details of a new developers' package for the machine.

'The machine deserves only our highest profile titles' said Ocean's Gary Bracey. Steve Clark, technical manager for Virgin Mastertronic said 'we can't fault the A3000 – the next stage will be to undertake a pilot project.'



Acorn is confident the A3000 will enjoy considerable support from the games industry and an impressive list of games for the A3000 is lining up: *Batman*, *The Untouchables* and possibly *Robocop* from Ocean. CDS is developing versions of *Collosus Chess*, *Collosus Bridge* and *Steve Davis Snooker* and Domark is releasing versions of *Hard Drivin'* and *Trivial Pursuit*.

BAU also understands conversions for the A3000 include *Robbery* from Anco, *Joan of Arc* from Rainbow Arts and *Outrun* from US Gold.

Cambridge International Software intend to release 20 games for the Arc by Christmas. Titles readily available now include both *Confusion* and *Alien-fighter*.

Dixons take on the A3000

Acorn has increased its Archimedes dealer network by persuading high-street retailer Dixons to stock the new BBC A3000.

The A3000 is the first 32-bit machine to be taken on by Dixons, and according to Acorn the agreement represents 'a renewed relationship' with the retail chain.

Dixons will be selling the A3000 in its top 20 business centre branches for the full retail price of £649 + VAT.

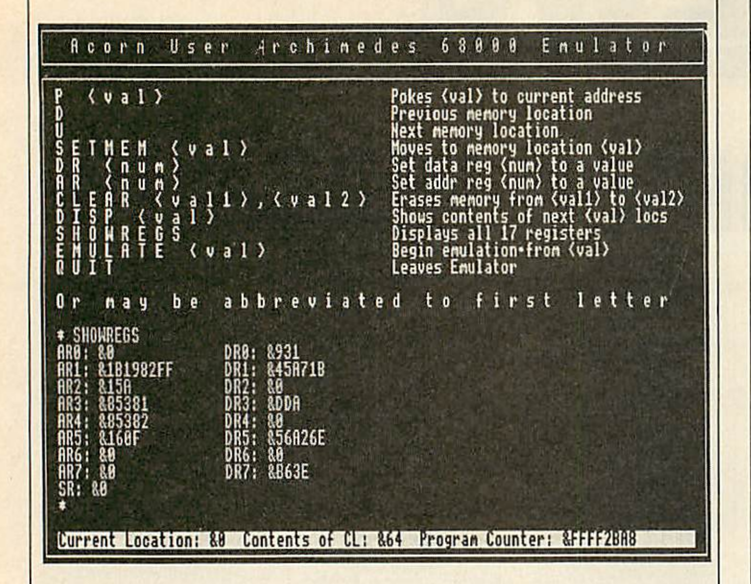
Dixons told BAU that the A3000 has been taken on for a trial period and 'if it is successful the A3000 may be placed in other stores throughout the country at a later date.

Dixons took on the A3000 because of its strong educational links and will push the machine as a low cost powerful DTP system.

Acorn is on (0223) 245200. Dixons is on 01-567 6611.



NEXT MONTH



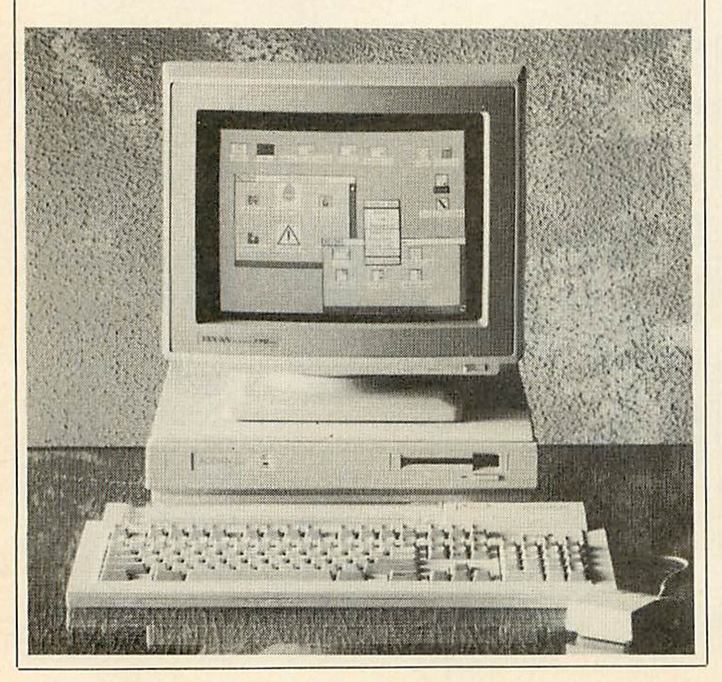
It's wrap up warm time again but rather than wear your copies of *BBC Acorn User* on the park bench this winter, get Auntie Agatha to knit you a warm woolly.

The December issue has the program to turn your Beeb screen into a knitting pattern even Auntie will understand.

Also, next month sees the Archimedes pretending to be what it's not. Readers just weaned off the ST or Amiga can run 68000 code from the safety of the nice friendly Arm in the Arc.

Plus there's everything you always wanted to know about Unix and the R140 but didn't know where to start asking.

And there are even more goodies to keep that warm glow inside. There's the low down on Forth, choosing the right spreadsheet, more 24-pin printers, a round-up review of Arc DTP software and more in the action packed December issue – out November 9th.



See P141 for the new SOFTWARE SHOWCASE

Telesoftware on Sid

Telesoftware for the Acorn range of computers that was featured on the now closed telesoftware service on Ceefax has found a new home on Acorn's support information database (SID).

Phil Colmer, SID manager has been given the go ahead from the BBC to use programs that were on Ceefax. 'I am trying to get in contact with authors who have written software for Ceefax in the past in order to get their permission' said Colmer 'and I would like to hear from authors, but they should understand that we (Acorn) cannot pay for programs as Ceefax did.'

The weather pictures which were popular on Ceefax will not appear on SID as the Met office intends to charge for them. However, Colmer hopes that educational notes of some type will be available.

BBC Acorn User will also be providing SID with a range of programs for the BBC micro in the near future.

Phil Colmer can be contacted at Acorn on (0223) 245200.

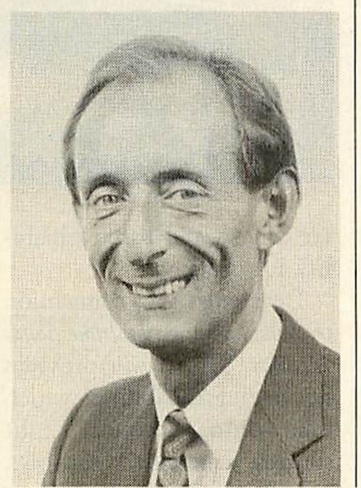
August appointments at Acorn

Acorn has appointed three new members to its management team. The posts filled in August were for finance director, sales manager and market development manager.

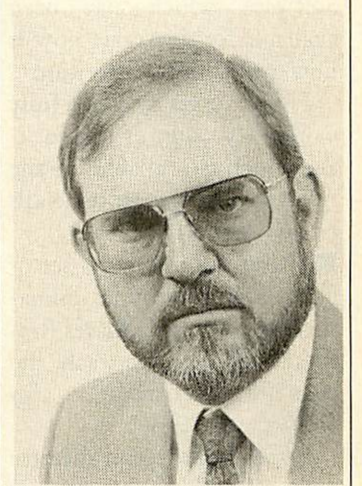
John Barr has been appointed to the newly created position of Finance Director. Prior to moving to Acorn, Barr spent 15 years with Rank Xerox where he held a number of posts in manufacturing and engineering. As financial controller for Rank Xerox export operations business in the eastern bloc soared three-fold.

Chris Humphries has been appointed as Manager, Sales Sectors. Australian born Humphries has an educational background. Previous posts held in the UK include assistant director of the national council for educational technology, IT programme manager with the council for educational technology and media resources officer with the ILEA.

Richard Summer has been appointed to the new position of International Market Development Manager. Summer will be responsible for overseas sales of Archimedes computers and Unix workstations. Summer has co-founded his own software house which developed and marketed software on both sides of the Atlantic.







The new Acorn men are, left to right, Richard Summer, John Barr and Chris Humphries

Folio for the A3000

The UK's best selling software package for primary schools is being developed for the Archimedes A3000.

Folio has sold over 20,000 copies and is a structured writing environment designed to help pupils use language creatively.

Software house ESM, in conjunction with the original author, will incorporate several new features that will enable teachers to control the level of complexity presented to children for re-drafting and complex page layouts.

Unix add-ons

Principle Acorn distributor Hugh Symons has released a number of peripherals for the R140 Unix workstation.

Two free-standing fast, high capacity hard disc drives and a tape streamer for use with Acorn's SCSI interface and a 19in high resolution monitor have been released.

The disc drives and tape streamer are free standing units. Formatted disc capacities of 158 and 327Mb with respective access times of 16 and 18ms are quoted. The quarter-inch tape streamer has a 6.5Mb/min data transfer rate and operates at a speed of 90 inches per second with a capacity of 150Mb.

Symons has also released the Viking II 19in monochrome monitor. The unit features a resolution of 1152 + 900 and has a video bandwidth of 110MHz. Manufactured in the US the monitor has been specially engineered for workstation users.

A four-port RS232 expansion card will turn the R140 into a six-user machine. This will enable users to take advantage of already ported multi-user software including *Uniplex*, *Informix* and *Q-Office*.

An unlimited Unix user license is available for use with the card.

Contact Hugh Symons on (0202) 740853.

Adventure ends

Adventure game specialist Level 9 Computing has pulled out of the Acorn market with the release of its last adventure game *Scapeghost*.

Level 9's managing director Pete Austin told *BAU* 'it's not worth doing any more games for the Beeb and we don't have any plans for the Arc.'

A major US company has commissioned Level 9 to produce animated adventure/arcade games for the Amiga, ST, PC and Macintosh.

'People have been declaring the death of the adventure market for years, so *Scapeghost* is an appropriate final release. It comes from the grave and you play a ghost.'

Scapeghost costs £14.95. Level 9 is on (0703) 338969.

News in brief

■ Epson has released two low-end printers for the home market.

The LX400 9-pin and LQ-400 24-pin printers cost £199 and £299 respectively. Epson is on (0442) 61144.

■ US based Radius Inc is the first company other than Acorn to use the Arm chip.

The 10Mhz Arm is used in an add-on card for the Apple Macintosh which increases the speed of Quickdraw routines.

■ The *Wordpower* word-processor from Ian Copestake Software which has been available for five years now is now available as Shareware.

For £5, users receive a fully working version of the package which is available for the full Acorn range. More details on 051–648 6287.

■ Clares has released a set of four discs containing animations created using Clares *Render Bender*. At £10 each the discs are *Close Encounters*, *Toy Soldiers* and *Mirrors*.

Render Bender script files are included enabling users to see how the effects are achieved.

Clares can be contacted on (0606) 48511.

Apology

Apologies to Cumana for printing its telephone number incorrectly. The correct number is: (0483) 503121.

Diary Dates

7–8 November. *Working Together* conference. Part of the British Computer Society's 'Disability programme'. Tel: Graham Watson, 01–874 0637.

10–13 October. *DES '89 Exhibition*, NEC, Birmingham. Design and Engineering Show. Tel: Phil Valentine, 01–948 9938.

24–26 November. *The Computer Shopper Show*, Alexandra Palace, London. Tel: Database Exhibitions (0625) 878888.

Serious software from Silicon Vision

Silicon Vision Ltd is currently developing three professional packages for the Archimedes.

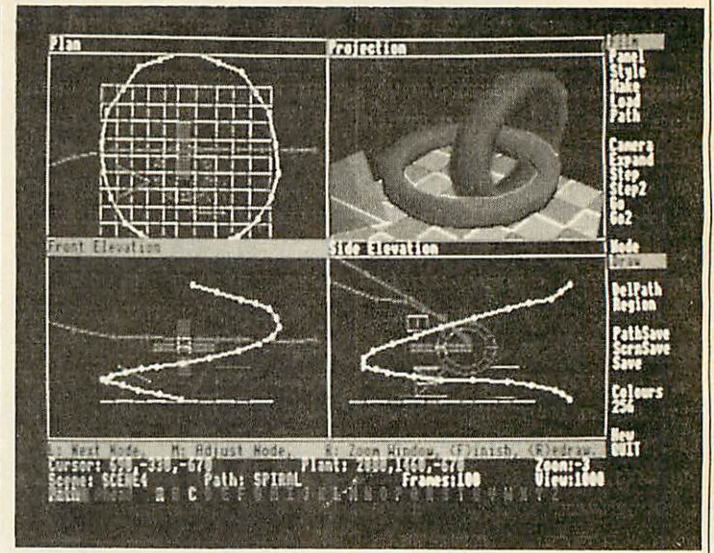
Robologo is an extension to the traditional Logo providing three-dimensional control of an articulated humanoid or an animal figure through the use of standard Logo language.

Two-dimensional turtle graphics and three-dimensional glider features normally associated with traditional Logo are also included.

The power of the Arm chip allows dynamic articulation of complex three-dimensional figures.

Billed as 'the ultimate PCB design package' Arc-PCB Professional follows earlier Arc-PCB package.

Features of the package include automatic routing, oval and circular pads with fully variable sizes, improved plotter drivers and batch capability for printing.



Developed as a companion to *SolidCad* and *Realtime Solids Modeller*, *SolidsRender* provides ray tracing capabilities which take into account light sources, reflections, shadows, transparencies, refractions and textures. *SolidsRender* can also integrate with the company's *FilmMaker* package allowing interactive design of animated sequences.

Silicon Vision can be contacted on 01–422 2274.

New fonts for Archie

Datathorn Business Systems has released two downloadable fonts for laser printers.

The fonts, Times Roman and Helvetica (in Roman 8 or UK Ascii) cost £30 each excluding VAT and are available for the Epson GQ–3500 and Hewlet Packard Laserjet Plus or compatibles. Both fonts are available on disc for the BBC model B and Archimedes in 3.5 and 5.25in disc formats.

The company has also developed Sprint, a Risc OS compatible Arc rapid sprite dump for use with the Epson GQ series of laser printers.

Datathorn can be contacted on tel: 01–508 4904.

Helvetica 6 point Bold
Helvetica 7 point Bold
Helvetica 8 point Bold
Helvetica 9 point Bold
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Helvetica 11 point Bold
Helvetica 12 point Bold
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Arc Econet software

Software Solutions has released three Risc OS compatible Econet software products for the Archimedes.

The disc sharer allows the hard disc of one Arc to be accessed by 32 other Arc or BBC micro users.

The print spooler allows a printer to be accessed transparently from other micros without having to wait for a current print-run to be completed. Remote logon gives a user full password protected access to the hard or floppy disc drive of their Arc from any Econet station.

The licence for the disc sharer and spooler are £137.50 and £81.25 respectively, and a single user licence for remote logon is £38. (0954) 211760.

Acorn Computers Ltd. is already established worldwide with its high performance quality computer systems and is the only company in Europe to have developed its own RISC processor. We are constantly striving to improve existing products and have an impressive development programme for new products and new markets. As an Acorn user you may have the skills we need to ensure that our programme stays on course.

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Ref AU/JM/013

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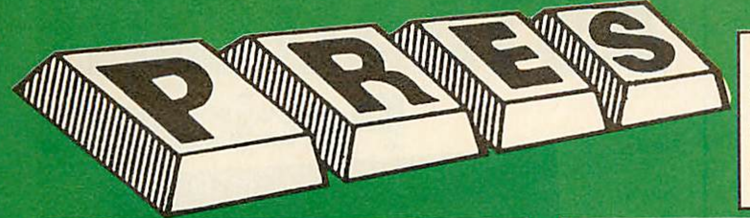
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both products as above *special price*. £19.95

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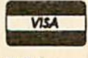
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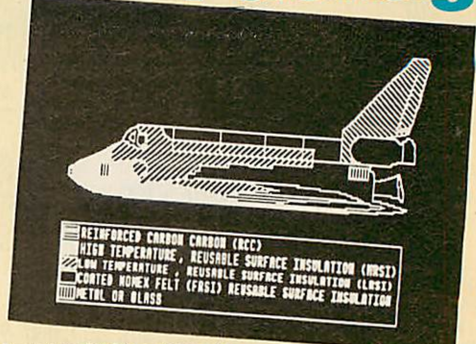
Name ....
Address ....
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Basic Booster ROM From BEEBUG

A selection of useful utilities to 'boost' the Basic in your computer and give more power to your programming.
All items have been carefully selected among programs published in various issues of BEEBUG magazine, and are also available as a Rom image on disc.

- **Super Squeeze** a program compressor which can remove REMs, blank lines, spaces, and compress variable names.
- **Partial Renumber** A very useful utility which renumbers a selected block of lines. Ideal for adding extra lines to the middle of a lengthy program.
- **Smart Renumber** Renumber a program to a standard format with procedures starting at a particular line number.
- **Program Lister** List any program (including Archimedes Basic) direct from a file.
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A comprehensive CAD package for the BBC Master and Compact offering:

From BEEBUG

- Free-hand drawing facility
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- 8 page manual covering the use of the system
- Sample picture files to experiment with

JUST A FEW OF MANY...

This is just a sample of the many useful programs that subscribers have received free in BEEBUG magazine. Each issue is crammed full of:

- handy utilities
- useful applications
- hints and tips on programming
- communications
- tutorial articles on getting the most out of your computer
- reviews of all the latest products for your machine
- educational programs
- games

RECENT ITEMS MISSED BY NON-SUBSCRIBERS

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512 Forum
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Investigating Teletext Mode
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When you subscribe to BEEBUG you get 10 magazines a year exclusively covering the BBC Micro and the Master series, and full of new ideas, stimulating articles and programs, mailed directly to your home, plus:

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- swift mail-order service,
- significant discounts on our own software range and on a wide range of other products,
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£25.00	Middle East
£27.00	Americas & Africa
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Please supply the Basic Booster ROM/disc and documentation for £6.00 + 60p p&p ☐
non-members' price £19.95 + 60p p&p ☐
Basic Booster Codes: ROM *Code 1403A* ☐ Disc *Code 1402A* ☐

Please supply the ASTAAD CAD package for the members' price of £9.95 + 60p p&p ☐
non-members' price £19.95 + 60p p&p ☐
ASTAAD Disc Codes: 80 track DFS - *Code 1407A* ☐ 3.5" ADFS - *Code 1408A* ☐

I would like to subscribe to BEEBUG Magazine and Support Group at £14.50 (UK) ☐

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SID signs to Prestel

The good news for Acorn users subscribing to Prestel is that Acorn's Support Information Database (SID) is now accessible through Prestel via a gateway.

SID provides technical support in a viewdata format and application notes and programs as well as E-Mail and bulletin board facilities.

Areas within SID include a help section for new users, a news area, new product descriptions, price lists and news releases. Four magazines on the database cover games reviews, book reviews, communications and programming languages.

Accessing SID via Prestel is



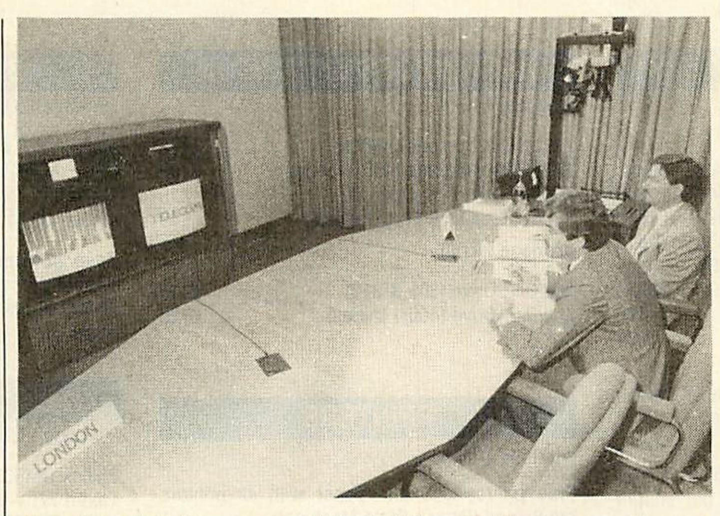
easy. Simply keying *SID routes you to the gateway page. Once connected for the first time you are invited to fill in your name and address.

First impressions: compared to Prestel, SID is rather slow but you soon get used to that.The database itself is very well laid out with sensible routing.

Costs for Micronet users accessing SID via Prestel are 8p per min between 8am and 6pm, 2p per min between 6pm and midnight and 1p per min between midnight and 8am.

Non-Micronet users pay 11p before 6pm and 4p thereafter. These charges include the standard Prestel connect charges but not the call cost.

Direct dial access to SID is also available on (0223) 243642 (three lines). Four Fastrak lines are also available.



One day all living rooms will look this way. The two gentlemen pictured above are taking part in the first (and probably last) BT video conference with Hong Kong.

So excited with the momentous occasion were the boys in London, that they needed a name plate with 'LONDON' printed on it lest they should forget where they are in all the excitement of transatlantic comms.

MODEM MAN

Many Beeb and Master 128 owners will remember The Voyager 7 and Enterprise modems from the now defunct Modem House.

This company was run by Keith John Rose who vanished from sight after the company went bust, owing money to suppliers and hopeful customers alike.

Rose has now popped up again – in court at Guildford, Surrey on 21 August charged with, of all things, blackmail and kidnap.

Rose was charged with threatening to kill Mr Victor Cracknell unless a one million pounds ransom was paid and demanding £142,000 with menaces from his millionaire father Mr Desmond Cracknell. Rose has since been remanded in custody.

More to the point for modem users, the Fraud Squad are now contacting Modem House customers still owed money or goods.

GUTTER PRESS

That bastion of truth *The News of the World* reported how a Micronet member was using Prestel to contact young children in order to have sex with them.

According to Micronet the 'Netter' was approached by a man via Prestel who said he was a procurer for an American pornographer. He attempted to persuade the Netter to help him procure children via the Prestel network for this purpose.

The Netter however refused, and it turns out the man was acting on behalf of *The News of the World.*

Needless to say, Prestel operator, Dialcom is not too happy with the said publication and is now considering what action to take.

■ Ever wanted to know how to kill a bulletin board? Leave on all the equipment overnight with no mains suppressor and wait for an electrical storm to zap your gear.

That's what happened to James Willmott who runs Odyssey BB which is now back on-line. Why not give it a ring on (0482) 870919 and say 'lightning' at 1200/75 and 300/300 baud.

■ Microlink is rather upset with Dialcom which operates Telecom Gold. Upon hearing that Microlink was to move to the new Istel network, Telecom Gold junk mailed quite a few Microlink users, enticing them to stay with Gold. This is a direct breach of Telecom Gold rules which state that no company or individual may junk mail!

Derek Meakin, boss of Microlink has reported the matter to Oftel – watch this space!

■ There appears to be a few bugs in the software on the Hi-Tek EC2400 modem which I've raved on about these past few months.

Contact Hi-Tek on (0733) 52440 (voice) to organise replacement Roms if the firmware in your modem is duff.

■ Telecom Gold is now providing Kermit as a file transfer protocol. Kermit may not be the fastest FTP there is but it's reliable and works transparently over 7 or 8-bit networks.

There are several public domain versions of Kermit available for the Acorn range of machines.

■ Talking of file transfer protocols, why are there no versions of 1K-Ymodem-g or Zmodem for any of the Acorn range of machines? These protocols are far better than Xmodem and Kermit. Read about them on the World of Cryton on (0458) 47608, all speeds up to V22bis.

A brave newcomer

At a time when most of the news seems to be all about companies closing, reorganising, diversifying or being sold off, it is refreshing to find there are still people around who have faith in the educational software market.

Appian Way Software, run by former teacher Peter Britton, is producing a range of software for History and Religious Studies.

The materials have all been developed by practising teachers who have looked to areas of the curriculum where few resources are available.

Like most good CAL-style software, these programs rely heavily on the use of interlinked classroom development work stimulated by the power of the software.

Although all of the programs have so far been text only, Appian now feels it is necessary to extend the appeal of the software by introducing graphics where relevant.

In the range of RE packages Appian has one developed in conjunction with the North of England Institute for Christian Education entitled *Making Choices*.

This deals with morals and ethical issues. The substantial *Palestine in the 1st Century* which runs to four discs was part-funded by the Scottish Education Department and is based around six journeys through Palestine by fictitious but authentic characters.

On the history side, *1066* and *The French Revolution* (topical, that one) provide a route into these topics which allows a degree of empathy with the historical situation.

For full details of all Appian Way publications, write to 34 Quebec Street, Langley Park, Durham DH7 9UU. Tel: 091-373 1389

'What is the difference between a pound coin and a computer program?' said one computer user to the other.

'Go on' said the other.

'Well, if we each have a pound coin in our pockets and I give you mine and you give me yours – how much do we have?'

'Nothing's changed – we've still a pound apiece' said the bemused friend.

'Fine. Now, if we both have a program. I give you mine and you give me yours, how many programs do we have?'

'Oh yes, I see' said the friend, the light dawning. 'We both have two!'

NOTES REPRIEVE

One of the biggest disappointments to educational users of the Ceefax telesoftware service, now demised, is the loss of the educational programme notes which used to be available for downloading from Ceefax to accompany the transmission of BBC TV educational programmes.

Fortunately, Acorn has taken over this part of the service and will be running an improved programme notes service in conjunction with the BBC using Acorn's own Support Information Database (SID) on-line Prestel type database system.

MESU HIDE AND SEEK

The much-maligned staff of the Microelectronics Education Support Unit (MESU) in Coventry are (not surprisingly) suffering something of an identity crisis.

News leaks out from the hallowed black portals of Sir Clive's former C5 manufacturing emporium on the Science Park of the University of Warwick that the organisation's recent change of name to the National Council for Educational Technology (NCET) was also accompanied by other hiatus.

Since many of the poor employees of this quango are on short term contracts there tends to be an air of 'look over your shoulder' even at the best of times.

This has been accentuated by the fact that certain elements in NCET have been fighting tooth and nail to have the centre moved to Milton Keynes where, some unkind souls have pointed out, Dr Noel Thompson, the Director of NCET, happens to live.

Not unnaturally, the expatriate Yorkshiremen, Lancastrians (and yes, even those from south of Watford) who comprise the team of officers of NCET have been made less certain about the wisdom of upping sticks and moving from Coventry when Dr Thompson went against the wishes of the DES and instituted a review of possible sites for the centre with parameters drawn up by himself and the NCET board.

To say the least, the effect on morale of staff at NCET must have been significant, particularly when the consultant concerned narrowed the possibilities down to York, Coventry and Milton Keynes, of which the latter was the most expensive.

The potential move was only averted by the intervention of the NCET board in mid-July, who stated categorically that the centre would stay in Coventry.

The sigh of relief was audible, they say, from as far away as Milton Keynes.

Nick Evans

■ NCET continues to provide a wide range of useful materials for trainers and reference materials for schools and their IT Co-ordinators.

One of the latest is the Guide to Databases which lists over 100 pieces of software to do with information handling.

The work ranges from the simplest primary package to complex data systems.

The educational price for schools, and so on is £5.50. The full price is £8.

The guide is from MESU Publications, Hoddle Doyle Meadows Ltd, Old Mead Road, Elsenham, Bishops Stortford CM22 6JN

■ Morley's *Smart Rom* is one of those packages which most people wrongly think is only for the techie user.

For example, the ability to freeze a program at any point during its operation is handy for all types of classroom purpose – as users of Nidd Valley's Slomo have found.

Moreover, it is possible to dump the entire screen to a printer or a disc. This works in any mode and is compatible with Epson printers.

The user can also save the place that they have reached in their program and reinstate it at a later date.

All of this costs only £30 for a cartridge to fit in your Master. Details from Morley on 091-257 6355

■ More *Key* datafiles have just been released *Antarctica, Rocks and Minerals* and *Periodic Table* all exploit the power of the *Key* information handling software to allow mapping of data and powerful graphing.

What's more, all of these files come complete with teacher notes and pupil worksheets which may be integrated into topic work in the appropriate subjects.

Details from ITVA, 6 Paul Street, London.

VOTE NOW

1989/1990 BAU AWARDS

Your chance to vote for all your Acorn favourites and to win a free subscription

With the wealth of excellent software and add-ons for the whole range of Acorn computers, we thought it was time the very best was suitably recognised.

Early next year *BAU* will be giving awards to the producers of the best software and hardware for the Acorn computer range. The winners will be announced in the magazine and the winning companies will each receive a prestigious certificate.

To choose the winners we need your help and below is the form for you to fill in to nominate your favourite software and hardware.

For most of the form there are two categories for each award – for 8-bit micros (that is, the model B, Master 128, Master Compact and Electron) and for 32-bit micros (the Archimedes and A3000).

Please fill in your nominations for all the awards in one category. Don't flit around between them! If you use both 8-bit and 32-bit machines then please fill in both columns.

There are also two general awards and the votes from users of either Beebs or Archimedes carry equal weight for these.

To be certain your vote counts, please make sure your completed form (or a photocopy if you don't want to desecrate your favourite mag) arrives at the *BAU* offices as soon as possible. We have ten free one-year subscritions to *BAU* for the first ten forms received.

Send your completed form to *BAU* Awards, Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ.

1989/1990 BAU AWARDS	BBC B/ELECTRON/MASTER/COMPACT	ARCHIMEDES/A3000
Best Software:		
Art/Graphics	....	....
Business	....	....
Music	....	....
Comms	....	....
Wordprocessing/DTP	....	....
Education	....	....
Best Arcade Game	....	....
Best Strategy Game	....	....
Best add-on/peripheral:		
Printer	....	....
Modem	....	....
Music	....	....
Digitiser/Scanner	....	....
Most innovative:		
hardware product	....	....
software product	....	....
Best advert in BAU in 1989	....	
Best article/program in BAU in 1989	....	

NAME AND ADDRESS ....

My computer is (please tick): A3000 BBC B/B+ Master 128 Compact Archimedes

Computer shopping is fun at the Computer Shopper Show!





Yes, for three exciting days in November, Computer Shopper will turn Alexandra Palace into the world's greatest computer show. Everything you need for business and leisure computing will be available under one roof – with experts to help you make the right choice!

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Why not start right here! By ordering your tickets in advance you will save £££s! Simply complete and return the coupon with your payment or telephone the Credit Card Hotline on 051-357 2961 to place your order.

Prestel or Microlink
To place your order by Prestel, Key +89, then 614568383. Microlink users should key 72:MAG 001. **Please quote your credit card numbers and your full name and address when you place your order.**

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LETTERS

BBC Acorn User, 20-26 Brunswick Place, London N1 6DJ. BTG/TTNS 81:RED001

NOT PORNOGRAPHY

I wish to complain about the news story 'Dirty Data' as published in the July issue of *BBC Acorn User* and to make some general comments on the content. I am the System Operator of one of the bulletin boards, *Heartbeat*, discussed in the story.

Heartbeat is mentioned in the same context as other boards run for entertainment, whereas we run a community service for the disabled where they may get help and advice. We believe your story could mislead the public and may put them off using what is an important form of communication for the disabled.

Further, the adult area on *Heartbeat*, which deals with the sexual problems of the disabled, is but a small part of the board and is closed to users unless they wish to use this area. To gain access, users must write to us stating their age, giving some proof of identity and promising to abide by our code of conduct.

We reject the statement that little or no check is made on users joining the adult area of the bulletin board. We check every application as carefully as we can before users are allowed to join. They must also pass through two 'pages' forming an electronic contract which states that the information they access is for private use only.

The story concludes with a Police statement implying that the boards mentioned were not legal or moral. In fact Superintendent Bennett was not aware of *Heartbeat* and was refering to the pornographic boards which had been brought to his attention.

In summary, I understand *BBC Acorn User's* concern about the potential abuse of bulletin boards, which we all condemn, and we endeavour to prevent with our system of written requests and contracts. However, in raising the issue, you have given totally the wrong idea about *Heartbeat* which implies the board is run for entertainment and contains pornographic material. We do not offer pornographic computer pictures, games or any similar material which pornographic bulletin boards might offer. The board simply has an area for disabled users to discuss freely any problems they may have.

We believe that in publishing the story you could damage the rights of the disabled to discuss their problems freely. I hope you will do your utmost to correct the misleading impression created.

Susan Wearing
Heartbeat

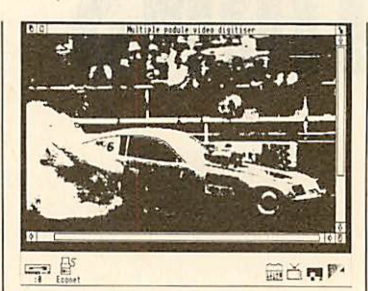
BAU, of course, supports every effort to help the disabled and we are indeed sorry for any damage to your cause resulting from this story being published.

Readers may contact the *Heartbeat* bulletin board at V21/V23 speeds on (0734) 352032

BRAIN TRANSPLANT

Your professional review of the Brainsoft Multi-pod board in the September issue of *BAU* pointed out some deficiencies of the product.

The ziz-zag pattern on grabbed video frames was due to interference with Risc OS interrupts. That has now been cured. In addition, the fault



with the contrast levels has also been solved.

Thank you for making the point that the digitiser makes an ideal 'scanner' with a second hand black and white camera (costing about £60). It has comparable resolution, 16 times more contrast and grabs pictures quicker than any scanner is capable of doing.

Lastly, the audio was critisised as being noisy. This is rather embarrassing – we failed to mention that a separate analogue ground is available on the 15-way socket. With the audio ground connected to this, the sampled sound is significantly clearer and distortion free.

Richard Brain
Brainsoft

Brainsoft has provided *BAU* with an updated board and software and we are happy to confirm these improvements. Digitised video pictures are much clearer (as the example shows) and the sound is now noise-free.

THE WRONG CHIP

The September 1989 issue of *BBC Acorn User* said in the Questions and Answers section that there is only one DFS now available for the model B and that Acorn no longer supplies its own version.

Acorn continues to sell large quantities of the 1770/1772 DFS upgrade for the model B. The current version (ANB31) costs £49 plus VAT plus fitting.

This, and many other support products are listed in the June *Acorn Retail Price List*.

David Bell
Acorn

Quite right. What we meant to say was that Acorn no longer supplies the original 8271 type DFS for the model B. The 1770 version is now the standard type anyway. Sorry for that.

THE WRONG PRICE

The prices quoted for Beebug C and the Stand Alone Generator in the review in your September issue were totally incorrect.

Beebug C costs £59 (including VAT) and the Stand Alone Generator costs £19. Both are available together with a copy of *The C Programming Language* by Kernighan and Ritchie for £101.75.

John Wallace
Beebug

THE RIGHT STUFF

I have followed your series on the Apec Arc interfacing card with interest.

Do you intend to follow this up with further projects for this excellent board?

Bob Mason
Weymouth, Dorset

We do intend to publish further projects for the Apec card in due course. Any ideas for suitable projects from our readers would be greatly appreciated.

QUESTIONS AND ANSWERS

If you have a problem with an Acorn micro, commercial software or a program you are trying to write then *BBC Acorn User* can help. The Post A Problem service guarantees to give you a personal answer within 10 working days for just £4.

Write out your problem with as much detail as possible and, if a program is involved, include a disc or cassette. Fill in the coupon at the bottom of this page and send it and your problem along with a cheque or postal order for £4 (including VAT) made out to Redwood Publishing. If you want recorded delivery add on the cost of this.

Please note that debugging readers' own programs or those from other magazines is a complex task and we cannot guarantee to give a full solution. Unless the problem can be spotted quickly, the Post A Problem service will only be able to make general comments. The service will answer the problem and return all material received within 10 working days of receipt. If we fail to match this promise then your cheque or postal order will be returned – you can't lose!

BBC ACORN USER READER SERVICE
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I enclose a cheque/postal order for £4 made out to Redwood Publishing and an sae with my problem.

OFFICE USE ONLY Date in:
Date out:
Answered by:

Q I am a newcomer to programming in Basic but I want to write structured programs. I am confused about the difference between functions and procedures in BBC Basic. Can you explain?

A If you are going to use a structured approach to your programming then you need to use both procedures and functions.

Functions and proceedures both work under the same principle. You identify some small routine or task within a program and you 'package it up' with a name. Then, whenever you need to use that routine you call it by name.

The real difference is that a function always returns an answer or a result and a procedure performs a task which may or may not produce any results.

Q I am an avid user of *First Word Plus* on my Archimedes 310. Are there any specialised dictionaries published for use with this wordprocessor?

A Yes, Science Frontiers of 7 Porthill Court, Aberdeen AB1 1DU publish a number of specialised supplementary dictionaries for *First Word Plus*. These cover computing terms, proper names and geographical locations. They also publish an 80,000 word main dictionary too.

Q I am confused about disc formats on the Archimedes. I understand there is more than one. What are they? Will my new BBC A3000 be able to read them all?

A There are certainly a number of different disc formats available for the Archimedes.

There is the L format for compatibility with the older BBC machines running ADFS. This is a 640K format. The D format was introduced for the Archimedes only, with the Arthur Operating System. This formats discs to 800K.

Now with the release of Risc OS there is another Archimedes only format called the E format. This also holds 800K.

There is no need to panic about your Archimedes being able to understand all these formats. The formats are transparent to the user.

The computer knows what format each disc is and reads and writes to it accordingly.

Q I have an IBM PC and an Atari ST and would very much like to transfer files to my new Archimedes. I have heard the Archimedes can read these discs. I have tried but without any luck. What technique is needed to achieve this?

A The Atari uses an MS-Dos like disc format so you could transfer both your IBM PC discs and your Atari ones with the Archimedes PC emulator using the *GetFile* utility. However, this can be quite difficult with a system with only a single drive.

There is an easier way. The November 1988 issue of *BBC Acorn User* published a transfer program and plenty of guidance on its use in the *Arc Agora* section which enables the Archimedes to read non-standard discs. This should help show you the way!

Q I want to use my BBC model B to superimpose text over a television picture for adding subtitles. How can this be done?

A Computer text or graphics can be overlaid on to a video picture using a system called a genlock. This combines the two signals to produce one signal containing

both television and computer pictures and so keeping the computer in step with the video signal.

Several companies manufacture genlock interfaces (but they are expensive). I suggest you try Wild Vision at 6 Jesmond Place, Newcastle-upon-Tyne NE2 4PQ.

Q I am an ADFS user on my Master 128. Suddenly one of my text files has got an E attribute assigned to it. What is it? How did it get there and how can I get rid of it?

A The Acorn ADFS has the special E attribute to protect files so they can only be *RUN and not loaded or listed. Once the E attribute has been set, the file cannot be removed and neither can the attribute be altered!

However in the February 1988 issue of *Acorn User* in the *Acorn Forum* a short program included on the monthly disc is discussed. This program will remove the E attribute from all files in a specified directory, allowing you access to your files again and the possibility to delete them too.

Q I am having problems in printing pages of text with *Interword*. The first page is alright but by the time I have got to the third the printing is off the edge of the paper.

A It can be difficult to set the correct number of lines per page unless you understand it sufficiently.

Standard tractor feed paper is exactly 11 inches long, allowing 66 lines a page with the printer working at a standard six lines per inch. This is the default page length setting with *Interword*.

Cut sheet paper comes in a number of sizes. True A4 paper is 11.75 inches long and does not hold an exact multiple of lines at six lines per inch. Setting the number of lines to 64 should be suitable for friction feed.

Foolscap paper is longer than A4 and is exactly 13 inches. This will hold 78 lines at six per inch so setting the number of lines per page to 72 should suit friction feed.

You may find Rob Pickering's book *Understanding Interword: Beginners Guide* helpful.

Q I am a teacher and use Logo a lot with my class. How can I print out screens they have created with Logotron Logo on our BBC Master in colour with the school's Integrex inkjet printer. Is there any software available to do this?

A Stour Software of 25 Stour Drive, Wareham, Dorset BH20 4EW publishes the *Master Use Module* which includes four screen dumps for use with the Integrex inkjet printer range. They are accessed by star commands while the Logo screen is displayed.

Q At the office we use the *EZ-Forms Lite* program with our IBM PC compatible to design forms. I have just purchased an Archimedes A3000 and wondered if there is a package I could use in the 'native' mode rather than run *EZ-Forms Lite* on the PC emulator.

A You could try *The Forms Manager* from Mewsoft, 11 Cressy Road, London NW3 INS for £27.90.

This is based on the highly successful *A4 Forms Designer* package for the BBC series but it has been considerably updated to include large fonts, standard sized text, lines, boxes and grids to design forms up to A4 in size. It is even possible to use *The Forms Manager* to produce personal organizer forms.

ACORN CUSTOMER HOTLINE

The Acorn Customer Support department has had a number of enquiries regarding the SCSI and Floating Point expansion cards for the Archimedes.

I will take this opportunity to clarify the situation regarding these expansions on the 300 series and 440 Arc.

The SCSI expansion card will work on the Archimedes 300 series and 400 series computers. The 440 and 300 series Archimedes (but not the 400/1) require the MEMC1a chip to use this expansion. This new memory controller chip is already fitted to the newer Arc 400/1 series and to the A3000).

If you own a 305/310 or a 440, you should specify to the dealer you will need a MEMC1a upgrade when you have the card fitted. The dealer will know how to obtain the upgrade and fit it.

The upgrade is supplied free of charge and fitted free when you purchase either the SCSI or Floating Point Expansion cards.

Only 1 MEMC1a upgrade is supplied per expansion card so if you wish to use the SCSI expansion on more than one computer, you must purchase further MEMC1a upgrades separately.

This chip also provides 300 series and 440 owners with the speed increase A3000 and 400/1 owners have.

Almost the same situation applies to the Floating Point unit but it should be noted the Floating Point card will only work on the 440 and 400/1 series Archimedes.

The Floating Point Unit also requires MEMC1a to run and the same situation applies here as with the SCSI.

■ The Master Compact is supplied as standard with a 3.5in disc drive. However, it is possible to attach a 5.25in disc drive to the Compact via a ribbon cable.

Customer Services are able to supply a copy of the application note which details how to make your own cable.

You will then need either an 80 track or a 40/80 track 5.25in disc drive.

The most obvious reason for connecting 5.25in drive is to run BBC software on the machine. To read the majority of discs supplied for the BBC B you will need a DFS sideways Ram image.

The DFS sideways Ram image has been supplied on the Compact Welcome disc in the LIBRARY directory. The filename will be either DFSx,xx (x,xx is the three digit version number, such as 2,25) or DFSimage.

This can be loaded using the following. Insert the Welcome disc, type *MOUNT 0 * LIBRARY (to find out what the filename of the DFS image is). *SRLOAD filename 8000 6. This will load the DFS into sideways Ram at position 6 – this position can be changed if you wish.

Note that if you have had any of the internal links of your Master Compact moved (if Roms have been inserted into the machine) the sideways Ram banks may no longer be available. If the image does not show up on the Rom table, try loading the image into a different sideways Ram bank.

If that does not work then it is likely you will have to move links to load the image in. Consult the User Guide.

There is no guarantee all BBC software will work. You should contact the manufacturer of the software to check it will work before purchasing a 5.25in disc drive.

Peter Dunn

Designed, & typeset



Impression is more than a word processor, it can handle complete documents ranging from whole books, newsletters, or technical articles, to single page advertisements. It can handle all aspects of the final printed result - the text, line graphics, photographs, company logos etc. Yet it can still be used to bash out a single page of text as well as any 'simple' word processor. It is a document processor.

RISCOS

Impression is one of the first products to take full advantage of the new multi-tasking WIMP based operating system for the Archimedes. Because it uses the windowing/pointer/menu facilities the product is simple and intuitive to use - long gone are the days when users had to remember commands, or codes for each operation. Considerable design effort has been expended on making the program simple to learn and simple to use - only five main menu options control everything within Impression.

Impression has been optimised to ensure the fastest possible screen update and this, in conjunction with the very responsive windowing environment, ensures even the most experienced word processor user will gain considerable benefits from this form of control.

Frames

Impression is a frame based page layout system. All objects on the page are held within frames which may be positioned freely anywhere on the page. Frames can contain text or graphics, they may overlap, and may be transparent or have any coloured background. They can have a variety of borders displayed around them and may be arranged in columns to create multi-columned text. Text may be forced to automatically repel around any frame so enabling text to flow around graphics.

A text frame may be linked to any other text frame (even on subsequent pages) so text will automatically flow from frame to frame and page to page. Since Impression has been designed primarily as a word processor, it is important that users can enter text unhindered. Therefore frames and pages can be created automatically as text flows out of a frame, ensuring that while text is being entered you do not have to worry about creating new frames or pages.

Graphics frames may contain any sprite (for example images from Scan-Light) or any Draw file. All graphic frames may have the picture scaled within the frame to any degree. In addition the aspect ratio of pictures can be controlled and even locked to any required value.

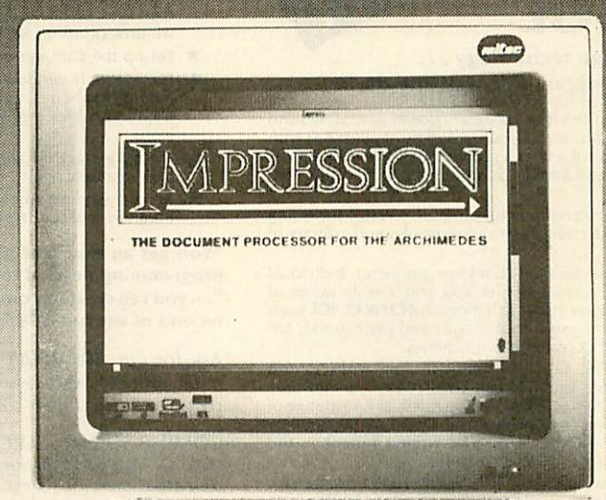
Windows

Impression can handle up to 16 documents in memory at any one time. Each document may be viewed in one or more windows. Each individual view may be scaled as required so that, for example, one view may be at 100% while another window shows the same document scaled to 20% so showing a live 'mini' view. This mechanism also allows two different parts of a document to be edited without the need to scroll between them. Impression can display its pages within the window as side-by-side left/right pages, and as vertically arranged pages in a more traditional word processor-like fashion. Not only does this present a far more WYSIWYG display but is also allows instant scrolling to any position in the document. There is no need to specifically turn over the page, thereby overcoming a limitation of traditional DTP systems. Since any window can be scaled to show a reduced view, this system also allows multiple page 'thumb-nail' views.

Spelling checker

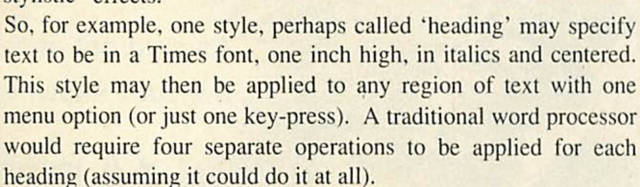
Included with Impression is a 60,000 word spelling checker providing some of the most advanced spelling facilities. Check-as-you-type, multiple user dictionaries, ignore dictionary, crossword and anagram solving and an intelligent 'guess' feature are included. Other related dictionaries control automatic abbreviation expansion as you type, and a hyphenation exception dictionary provides precise hyphenation control over and above the normal automatic hyphenation.

arranged on



Styles

Like the most powerful word processors on the Mac, Impression supports a system of styles. Rather than having fixed text effects such as bold, underline etc, Impression allows the user to apply any user named style to any part of the text. This style may be defined and re-defined at any time to represent any combination of stylistic effects.



So, for example, one style, perhaps called 'heading' may specify text to be in a Times font, one inch high, in italics and centered. This style may then be applied to any region of text with one menu option (or just one key-press). A traditional word processor would require four separate operations to be applied for each heading (assuming it could do it at all).

Printing

Included are the latest RISCOS printer drivers for Epson compatible 9 and 24 pin printers, LaserJet compatible laser printers and ink-jet printers, and PostScript printers. These printer drivers ensure the output is to the maximum resolution the printer can manage so ensuring the print is to the highest quality possible. In addition Impression supports 'text mode' draft printing so text may be output as fast as possible using the printer's character set. The user therefore has a choice between fast text only printing or high quality text (any font, any size) and graphics printing.

Impression comes with a 'no quibble' money back guarantee when purchased direct from Computer Concepts.

This advert was designed, laid out and edited on Impression. All logos were created in Draw and imported into Impression frames. The pages were then 'printed' via the PostScript printer drivers to disc. This disc file was then sent directly to a Linotron phototypesetter, which output the final camera ready artwork. The studio photographs were pasted in separately.

Other features:

- Master pages for consistent document design.
- All measurements may be specified in inches, mm, cm, points picas, all to an accuracy of 1/72000ths of an inch.
- Ideal for a 1Mbyte machine - over 300K of free workspace!
- Fast automatic disc spooling of documents larger than memory, again making Impression ideal for the smaller machine.
- Print multiple pages per sheet, any scale and rotated.
- Includes Acorn's new outline font manager and outline fonts.
- Very fast graphic scale and PostScript graphics printing.
- Automatic index generation.
- Package includes 200 page manual (produced entirely with Impression), including tutorial, introduction and reference sections. Four discs include Impression, the printer drivers, the outline font manager and fonts, example document, Line-art examples, utility programs etc. An Independently produced guide book to typography and page design is also included.

Contact Computer Concepts for a more detailed brochure.

£149.00 +VAT (£171.35 inc)



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ARC AGORA

THE PRIME OF LIFE

Your thoughts on prime numbers, finding out when Easter falls, the definitive text plotting routine, and your very own European flag

David Acton

Well, by popular demand, here are your numerous thoughts on the glorious subject of prime numbers. I must admit, when we carried Jason O'Broin's little program back in the August issue with a challenge for you to do better I expected only a mild response. As it was, I've been practically besieged by your solutions – in Basic, machine-code (Arm and 6502), C, Pascal and even a rather obscure statistical language called SAS.

Thank you to all who wrote in. I'll mention as many as I have space for. Apologies for those who I don't.

The methods used fall largely into two categories. First, many programs calculate primes by division – checking each number in turn for factors, like Jason's original listing. Various ploys were used here to speed matters up.

Even numbers were usually discounted and many programs submitted relied on the fact that primes bigger that 3 can always be expressed as either '6n-1' or '6n+1' for some integer n. And, of course, when checking a number for factors, you only need to check up to the square root of that number. Factors always come in pairs so the discovery of the smaller one implies the existence of the larger.

The method preferred by most though, employed the 'Sieve of Eratosthenes'. A table is built with an entry for each number in the range being checked. Then numbers are 'crossed out' if they are multiples of something (and hence not prime).

So, first all the even numbers are crossed out, then the multiples of 3, then the multiples of 5 and so on.

The sieve itself is used to find the next number to be used for crossing-out and, as before, the process stops at the square root of the size of the range. Finally, all those numbers which haven't been marked as multiples are printed out – they are prime.

5623	5639	5641	5647	5651	5653	5657	5659
5741	5743	5749	5779	5783	5791	5801	5807
5861	5867	5869	5879	5881	5897	5903	5923
6037	6043	6047	6053	6067	6073	6079	6089
6163	6173	6197	6199	6203	6211	6217	6221
6299	6301	6311	6317	6323	6329	6337	6343
6421	6427	6449	6451	6469	6473	6481	6491
6577	6581	6599	6607	6619	6637	6653	6659
6719	6733	6737	6761	6763	6779	6781	6791
6863	6869	6871	6883	6899	6907	6911	6917
6991	6997	7001	7013	7019	7027	7039	7043
7151	7159	7177	7187	7193	7207	7211	7213
7307	7309	7321	7331	7333	7349	7351	7369
7481	7487	7489	7499	7507	7517	7523	7529
7583	7589	7591	7603	7607	7621	7639	7643
7717	7723	7727	7741	7753	7757	7759	7789
7877	7879	7883	7901	7907	7919	7927	7933
8039	8053	8059	8069	8081	8087	8089	8093
8179	8191	8209	8219	8221	8231	8233	8237
8311	8317	8329	8353	8363	8369	8377	8387
8467	8501	8513	8521	8527	8537	8539	8543
8629	8641	8647	8663	8669	8677	8681	8689

The solutions using the sieve tended to be considerably faster than the others, although speedy division methods came from Jack Evans (in Basic) and Colin Attenborough whose Arm code version used a whizzy approximation for the square root function to improve performance still further.

The latter managed the original 1–10000 range in under three seconds. As for the sieve versions, the problem became a little silly really. Many machine-code solutions displayed the primes from 1-10000 in a second and of this, only about 0.02 seconds was actually being used in the calculation! The test becomes one of displaying numbers the quickest rather than finding them.

Basic sieves were also surprisingly zippy. Many managed the job in under four seconds and again, the constraint was the time taken in showing the numbers. Several readers 'cheated' by altering the value of @% so less time-consuming screen scrolling was required.

And so to the listings. Listing 1 is fairly typical of the Basic solutions to the problem. It comes from P Fobbester who gets £10. Sorry I can't give a prize to everyone, but I will mention those who

offered alternative fast Basic solutions – A St John, C P den IJzerman, M Kinghan and P Killworth. Mr Fobbester's program calculates and prints the required numbers in 2.16 seconds which is about 17 times as fast as the Arm code program that started this whole business off!

Listing 2 is a rather nicely written machine-code implementation of the sieve by Barney Hamilton who gets £15 for his troubles. Other good code versions came from M Harrison, K Harrison, D Denholm and H Klingspohr.

Other submissions on the subject of primes included a couple of solutions written in good old 6502 assembly language (one of which clocked up a time of just 1.73 seconds). A couple of readers offered corrections and additions to the August listing to speed things up and a lot of readers offered interesting tips on prime generation. We had a selection of programs from overseas readers (Germany, Holland, Switzerland, etc) including a fast but lengthy one from *Agora* veteran J de Boer.

A couple of readers compiled their Basic solutions into code using *ABC* from Dabs Press. The improvement in speed was quite impressive. I also tried compiling some of the offerings with *Riscbasic* from Silicon Vision and the results were also very good.

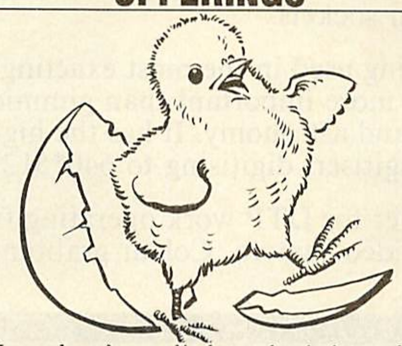
David Denholm suggested methods of reducing the size of the sieve so more primes could be calculated. Many of the listings you sent in used a whole byte or even whole word per entry in the sieve. This provides speed advantages but to calculate larger primes only a single bit is needed per number and even numbers can again be discarded to double the capacity of the sieve.

David also raised an issue touched upon by many who wrote in – that of 'honesty'. Is it fair to assume that 2 and 3 are primes or should we 'work these out'? At least one offering had a list of 30 or so of the first primes stored in a DATA statement at the end to improve speed!

Unfortunately, I think prime generation does have its limitations as a useful benchmark. Nigel Mason suggests an alternative though – 'perfect' numbers. A perfect number is one whose factors add up to itself. The first are 6 (1+2+3), 28 (1+2+4+7+14), 496 and so on.

Nigel's assembler program gets to the next (8128) in just under 10 seconds. So, if you can do better you know the address...

£5 EASTER OFFERINGS



Now here's a little submission that performs a calculation I've never had the patience to work out for myself. It's a set of date-handling procedures and comes from Colin Singleton (who also sent in a fairly nifty prime number sieve). You'll find them on the end of listing 3 in the yellow pages.

The function FNj(d,m,y) takes a date, month and year and returns the 'Julian' version. This is simply the number of the day since day 1. Day 1 in this case is March 1st 1900 and the year provided is assumed to be in the range 00 to 99. Julian dates are very useful, as Colin points out, when it comes to making comparisons.

The other functions, FNd, FNm and FNy perform the reverse calculations. A side effect of using Julian dates is that the day of the week can easily be found. All of the procedures will work on Beebs and Masters too although the demo I've tacked on the beginning is for Arcs only.

The best procedure of all though is PROCe which takes a year (in full, not just the last two digits) and returns the date of Easter Day for that year using the Gregorian Calendar. (I've never been able to work it out!) The value returned is a date in March – if this is greater than 31, it's actually a date in April so subtract 32 to get the correct number.

£10 SCALE TALE

```
This is half size text
This is normal size text
This is double height text
This is double width text
This is double size text
```

I couldn't begin to estimate just how many double-height and double-width text plotting routines we've carried in *BAU* (and plain old *AU* before it) over the years. So here's the definitive Risc OS version – the fastest, shortest and positively final scaled text routine.

Alistair Brown is responsible and he receives considerable universal acclaim for saying the last word on this favourite of *Hints and Tips* topics.

Risc OS supports many extensions to the VDU commands of Arthur and one such is the sequence:

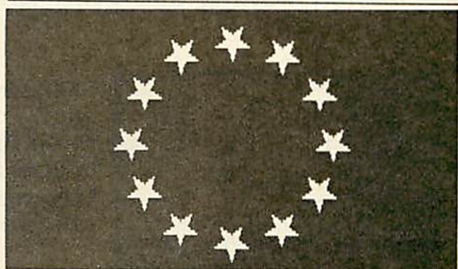
```
VDU 23,17,7,action,xsize;ysize;
```

This sets the width (xsize) and height (ysize) of text characters printed in VDU 5 mode. These dimensions are in pixels and the default setting is eight for each. Currently, the following values of 'action' have meaning:

action=2	set character size
action=4	set character spacing
action=6	set size and spacing

Listing 4 on the yellow pages shows the command in action. It's quite amazing how readable half-size text is considering there's hardly any information on the screen for the eye to pick up on.

£5 EURO STANDARDS



This one comes from David Peterson. It's a simple enough program that produces the European flag on your own screen so you can sit in your own armchair, put up your own feet and contemplate the joys of 1992 and all it will bring.

Just think, you could be the only one down the pub who knows what the European flag looks like.

The proportions of the flag, David assures me, are correct. I'm not sure what shape the Europixel is – almost certainly not anything as useful as square.

Those of you new to the Archimedes might like to look over David's listing by way of an introduction.

Programs, ideas, hints and tips are always welcome – please send them to: Arc Agora, BBC Acorn User, *Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ.*

HINTS & TIPS

DOUBLE LABEL CHECK

Ensure you haven't over defined your labels, recover those lost files, plus among other things, learn how you can project a finishing time for those long haul jobs

David Atherton

Joe Abley from Bedford has sent in a bumper crop of hints and tips, starting with this extremely useful utility for assembly language programmers.

How many times have you been trying to debug some 6502 on a BBC or Master, which just doesn't work rationally? And you don't know why? And then, after a couple of hours struggling, pulling out your hair, etc, you realise it was all due to multiple label definitions?

Defining a label more than once in the Basic assembler doesn't produce any errors, which can be a real pain at times. What is really needed is a program that will check through the listing, showing the lines where labels have been defined more than once. That is exactly what we have here.

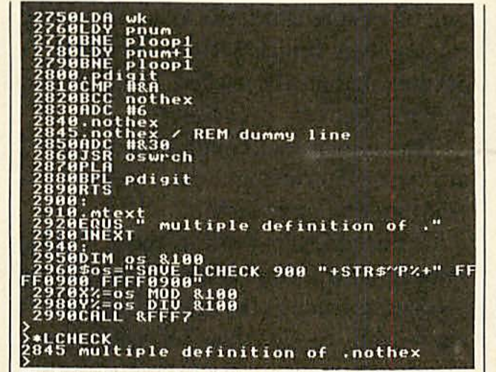
Type in the program from the yellow pages and it will produce a file called LCHECK. This file is a machine code program which runs from &900 and does not corrupt the current Basic source program in memory. When you have your assembler source file in memory, and are testing it, you can check for duplicated labels in your code at any time by typing *LCHECK.

If there are no duplicated labels, the program does not generate any output, and simply returns to the Basic prompt. However, if there are duplicate labels, the second and further duplicate labels are listed as:

```
980 multiple definition of .buffer
1080 multiple definition of .buffer
2990 multiple definition of .ptr
```

and so on. The above output would mean that the label .buffer had been defined three times in the program, the last two definitions being at lines 980 and 1080, and the label .ptr had been defined twice, the second definition being at line 2990.

The program works by passing through the Basic source (which always starts at PAGE, stored at &18) to the end. The program works by searching each line (or statement after a colon) and identifying those where the first non-space character is a full stop. This is assumed to be a label.



```
2750LDA wk
2760LDY pnum
2770BNE ploop1
2780LDY pnum+1
2790BNE ploop1
2800.pdigit
2810CMP #&A
2820BCC nothex
2830ADC #6
2840.nothex
2845.nothex / REM dummy line
2850ADC #&30
2860JSR oswrch
2870PLA
2880BPL pdigit
2890RTS
2900:
2910.mtext
2920EQUS " multiple definition of ."
2930]NEXT
2940:
2950DIM os &100
2960$os="SAVE LCHECK 900 "+STR$~P%+" FF
FF0900 FFFF0900"
2970X%=os MOD &100
2980Y%=os DIV &100
2990CALL &FFF7
>
>*LCHECK
2845 multiple definition of .nothex
>
```

Find duplicated labels in your code

The end of the label is determined by a space or the end of that statement (a carriage return or colon).

The labels are stored in a buffer immediately above top, but a check is made to ensure the label stack does not stray into screen memory.

As each label after the first one is found, it is checked against the previous labels in the stack, and if the definition already exists, the 'duplicate' message is printed out.

The program will work on any BBC micro, Master or Electron, provided there there is sufficient memory to build the label table.

If your program is very long, select MODE 7 (or MODE 135) before running the LCHECK command. If you have a 6502 second processor, set PAGE to &1100 and reload your Basic source before attempting to run the program.

Second processor users may also reassemble the code at &300 where it will run satisfactorily working on a Basic program at the normal PAGE setting of &800. (This tip, incidentally applies to many machine code programs designed to run at &900 on the I/O processor.)

DELETED PROGRAM RECOVERY

How often have you deleted a file, only to wish you hadn't done so? Or perhaps you have scrambled the catalogue of your disc possibly by using a dodgy DFS, or some similar problem.

Recovering files is a thorny topic, and working with a sector editor or other similar tool is difficult at the best of times. Unless you are of a technical bent, it can be near to impossible.

There are three types of file you would normally want to recover – datafiles, machine code programs, and Basic programs. The first type of file is normally straightforward to recover with a sector editor, as most sector editors display the Ascii characters contained in each sector. The other two types are more difficult.

Machine code programs are virtually impossible to recover, as they can contain just about any type of data, and are in any event not very useful without their catalogue information.

Basic programs are another matter. All Basic programs start with a certain sequence of bytes, (&ODOO) and end with another given sequence (&ODFF). The program provided here, again by Joe Abley, ignores the catalogue totally and steps through the disc to find Basic programs. When it finds one, it works out its length, invents a name for it and reconstructs the catalogue sectors to include the program.

This is assuming the files have not been overwritten. When you delete a DFS file, all that happens is that the catalogue entry for that file is deleted. The file is unaltered on the disc so any machine code programs or datafiles on the disc will be unaltered by this program and can be recovered using other methods.

To use the program, take the disc from which you have inadvertently deleted files and copy all the good files onto another disc, using the *COPY command. This precaution is necessary because in effecting a recovery, the program first completely wipes the existing catalogue. Any good files which are Basic programs will of course be recovered, but other types of file will be lost.

Then run the program, and tell it which drive you are recovering (0, 1, 2 or 3) and whether the disc has 40 or 80 track format. The recovery will then commence. The screen reports each Basic program it finds and the address at which it was found. A small 'meter' of boxes across the bottom of the screen shows how much of the disc has been searched.

When the program has finished, if you catalogue the disc, you will see one or more files with numbers for names. These are the Basic programs recovered. To find out which is which, LOAD each one in turn, and then *RENAME it appropriately.

If you have a disc with faulty catalogue sectors – ie you get a message such as 'Disc Error O8 at OO/OO' then one possibility is to enter Sector O Track O with a sector editor, alter one byte (say the first byte in the sector, which is the first name of the title) and save the sector back to disc. This will often cure faults, but may corrupt the catalogue. A similar activity on Track O Sector 1 may also be needed. Then you can run the recovery program.

```
   DFS Recover v1.0

&03E00: 06/02 → BASIC → Bad Program
&05400: 08/04 → BASIC → Length &89D
&05D00: 09/03 → BASIC → Length &1B73
&07900: 0C/01 → BASIC → Length &1BE
&07B00: 0C/03 → BASIC → Length &1C3
&07D00: 0C/05 → BASIC → Length &399
&08100: 0C/09 → BASIC → Length &48D
&08600: 0D/04 → BASIC → Length &E53
&09600: 0F/00 → BASIC → Length &3352
&0CA00: 14/02 → BASIC → Length &B09
&0D600: 15/04 → BASIC → Length &FE1
&0FE00: 19/04 → BASIC → Length &A36
```

Recover deleted programs

This is because although it doesn't need any particular catalogue data, it does need readable catalogue sectors.

If this doesn't work a more drastic remedy is to format track O only. Some formatters (such as the one in *Disc Doctor*) allow you to do this. Of course any programs stored on track O will be lost but other parts of the disc will be unaffected.

The program works by rewriting the first two sectors of the disc to include one large file, '$.O', which includes every sector on the disc. This is then opened for reading and scanned for Basic programs.

As each is found, a catalogue entry is built up in memory in the format of the disc catalogue. When the whole disc has been scanned, this catalogue is written to the first two sectors of track O.

The program works on all 6502 BBC Basic machines with DFS. Note the utility does not work with ADFS and any attempt to read ADFS discs will cause an error. Also, although the program should work with compatible DFS systems such as the Watford Electronics DFS, it will not work with any of the extended catalogue DFS systems.

LIST IF FOR BASIC

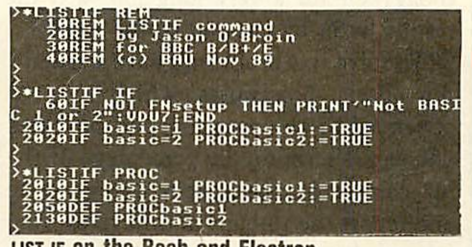
A very useful command in Basic on the Compact and Master is the LIST IF command which will only list those lines containing a certain string. For example if you type LIST IF Hello, only lines containing the word 'Hello' would be listed. The

listing is as normal – the full line with line number. Obviously, such a word would only be in a text string, perhaps in a PRINT or REM statement.

More useful is the ability to list keywords. The command automatically tokenises any argument given, so LIST IF DEFPROC would list the first lines (and therefore the name and parameters) of each procedure.

Regular, Jason O'Broin has provided a program which performs the same function on a BBC model B or Electron using Basic 1 or 2. As you may know, I don't normally like publishing programs which can only work with Basic 1 and 2 as they exclude Master owners but in this instance, as the command would be redundant on a Master anyway, there is no problem. If you have a Master, do not try to run this program.

To use the program, type in the listing in the yellow pages, and run it. A machine code program called LISTIF will be created on disc. To use it, load in your Basic program as usual, and when you wish to list a particular section, type *LISTIF <target string> and all lines which contain the target string will be listed. Because the machine code program resides at &900, it will not interfere with your Basic program.



LIST IF on the Beeb and Electron

When you run the program and create the LISTIF file, the assembly includes automatic detection of whether you have Basic 1 or 2 fitted to your machine (you can use the same test by typing VDU ?&8015). The assembled program is created accordingly. Therefore a version of LISTIF assembled on a Basic 1 machine will not work on one with Basic 2 and vice versa. This is a point to note if you intend putting the utility in a network library. Of course, it is perfectly possible to write additional code which includes the Rom addresses for both versions and have it autodetect the Basic version at runtime but this is rather unnecessary for most users, and adds to the code length.

If your program contains text in REM, PRINT, DATA, INPUT and so on, which is the same as one of the Basic keywords, for example:

PRINT 'INPUT NEW DATA FOR NEXT TIME'

which is an extreme example, then typing

WLISTIF DATA

would not find this string, as only the tokenised version is searched for.

The way round this is to search for less than the full word. *LISTIF ATA will find the above line. A corollary is that you may type the argument using the standard Basic abbreviations. For example *LISTIF E. will find all lines containing the keyword ENDPROC.

When relisting the lines, the program correctly detokenises them, using routines in the Basic Rom (including the line numbers after GOTO and RESTORE).

The program will also take some account of the current LISTO option, correctly indenting lines if set but the

indenting for FOR and REPEAT has been ignored, to save space.

The other difference from the command as provided on the Master is performing a LISTIF between line numbers has not been supported. On a Master, you can type LIST 200,300 IF NEXT and lines containing NEXT with line numbers in the range 200 to 300 only are listed.

The program works by tokenising the argument from the command line, and passing through the Basic program looking for a match. When a match is found, the Basic Rom LIST routine is used to output the line.

TIMING FOR LONG JOBS

One use that the BBC micro range is put to, especially in scientific and industrial environments, is to run jobs which take several hours or even days.

A problem when performing such work is that it is not easy to tell how long a job is going to take. You know it's more than an hour or two, but will it finish today? Or for a very long job, will the results be in by the end of the week?

To solve this problem, I have written a few Basic procedures which can be appended to any program, and provided you can determine the percentage of the job completed, the system will generate and report the amount of time remaining to complete the job, and for users with realtime clocks, (Master 128, Archimedes or BBCs with add-ons) the actual time (and day) that the job will finish.

To use the system, add the procedure PROCtime to your program. If you have a realtime clock, add also the procedure PROCmtime. To display the time to run, and finish time, you can add the procedures PROCshowtime and PROCmshowtime respectively. Alternatively, you can use your own output routines. The variables dtr% and torun$ contain the number of days and the time (hh:mm:ss) left to run and for realtime clock users, etad$ contains the name of the day, and eta$ the hours, minutes, and seconds of the estimated finish time.

Three functions, FNtime2, FNtime3 and FNtime4 must also be included. These perform subsidiary operations on the data.

To make the procedures work with your own programs, you must initialise the timing system by setting TIME=0 at the start of the program. From then on, it is assumed your program will follow a main loop. If this loop is determinable in size, it is relatively straightforward to calculate the percentage of the calculations that have been completed.

In the example program, the percentage is calculated on a simple FOR ... NEXT loop by dividing the control variable's current value by the final value. The variable is required to pass as a parameter to PROCshowtime and PROCmshowtime, and should be a floating point number between 0 and 1.

You will probably notice in the example program that the time taken by the timing routines is more than that for the main routine. This is obviously because the test routine is trivial and the timing routines are being called very often. Obviously the reported duration and finish time will only be accurate if you display the answers immediately after calling the routine.

The procedures have been written in such a way that they will be accurate

whenever called, provided your percentage figure is accurate. They do not need to be called at equidistant times, nor does the percentage have to necessarily reflect the complete program. The figures are calculated from the point where you set TIME=0 and to the point that you determine to be 100% of the job, whether or nor that is the end of the program.

Note, incidentally, when the routine first starts, it will be fairly inaccurate until, say, 0.5 per cent of the job has been completed. The accuracy improves as the job continues but due to the amount of time taken to run the routines themselves and slight discrepancies between the internal timer and the realtime clock, the duration and finish time may oscillate by about 0.1% during the run.

The program works by calculating the time already taken and dividing this by the percentage figure given as already completed. This gives the total time of the job. Calculations are done in seconds. The time already taken is subtracted, to give the number of seconds left to run.

This is then split into days, hours, minutes, and seconds, using the normal technique of dividing the seconds by 86400, 3600 and 60 respectively and the relevant strings are created to report the time in an understandable manner.

For realtime calculations, the current time is read from the clock and converted into seconds. This is added to the remaining job time (in seconds) and a new figure obtained, which is again divided up. The finish day is calculated by adding the number of days to run to the current day, and a new day is calculated.

VECTOR LIST

A nice technical utility for programmers has been provided by Jason O'Broin.

This short program can be assembled and left on your program development disc. At any time when you want to look at the vectors, just type *VECLIST, and the screen will display each vector from USERV at &0200, to IND2V at &0232, with the currently set address (in yellow), and the default address (in cyan). The default addresses are read out of the default vector table in the operating system Rom which is pointed to by &FFB7 and &FFB8.

The program will work on any model B, Master or Electron, but note that if you are not working in mode 7, the colours will obviously not appear.

Also, characters 129-135 should be redefined to appear as blanks on a Master, or an unusual display will result.

The program works quite simply by reading the contents of each vector, and the default values from the table, and printing them out through a standard hex printing routine.

The time has come again to ask for further contributions to Hints and Tips. *Of particular interest are items relating to applications programs – word processors, spreadsheets, databases, art and DTP packages and so on, rather than just programmers' tips. You don't have to produce a program, text only tips are also welcome. Please send your submissions in printed* and *disc form, with listings conforming to the* BBC Acorn User layout. *Items stand more chance of inclusion if they are applicable to the BBC micro, Master and Electron, and are submitted in the desired form. Also, a premium is placed on originality – look through the old issues of the magazine to see if the topic has been covered before.*

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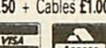
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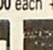
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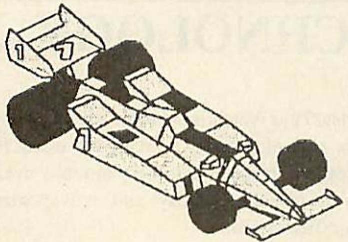
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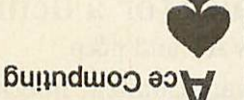
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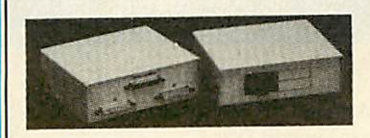
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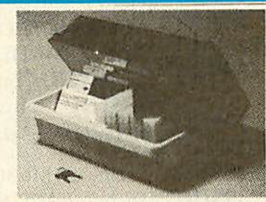
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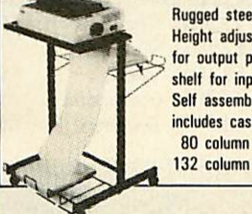


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(b) £3.50
(c) £2.00
(d) £1.00

Archimedes Computer Systems

All Archimedes systems are fitted with new RISC OS systems. Carriage £12/system £8/computer

Model	Basic	Colour*
A3000	£649	£849
310	£899	£1099
410/1	£1199	£1399
420/1	£1699	£1899
440/1	£2499	£2699
R140 UNIX System	£3500	

**Colour monitor can be Acorn AKF11 or Philips CM8833*

Technomatic Special Deal

To get you going on any of the above Archimedes systems you purchase from us, we will contribute 10% of its cost towards purchase of already discounted hardware or software from us OR you can use the contribution to take advantage of our special extended finance offer. You can also use the contribution to pay for the on-site maintenance contract.

Extended Finance

You can take advantage of our special finance deal by spreading your payments over 12 months at no extra cost as shown

	Deposit*	11 Instalments*	Final Cost (ex VAT)
Arc3000	£112.00	£57.67	£649.00
Arc3000 Col	£147.35	£75.36	£849.00
Arc410 1	£206.75	£106.55	£1199.00
Arc410 1 Col	£241.85	£124.27	£1399.00

*Deposit & instalment amounts incl VAT.

Similar prices apply to 420 1 & 440 1 base & col systems. Ask for details on 24 36 month finance. Technomatic is a Licensed Credit Broker

Techno 410/1 Upgrade Specials

1Mb RAM	£139	3Mb	£385
20Mb	£179	40Mb (Toshiba)	£310

(Price includes fitting)
These special prices apply when ordered with the computer, (you can use your discount entitlement to pay for these kits).

ON SITE MAINTENANCE CONTRACTS AVAILABLE

MONITORS

Philips 8833 14" Colour
Med Res, TTL/Linear input, Mono/Col switch, Stereo Sound **£199(a)**

Taxan 770+ 14" MultiSync
MultiSync AutoScan 14", ideal for general hi res applications on Archimedes. Incl Tilt & Swivel stand **£419(a)**

CM1686 16" Hi Res Col
Colour monitor for use with the high resolution modes on 400 series.
Resolution 1280 × 1024.
Supplied complete with swivel base **£1249(a)**

VIKING II 19" White screen
Ideal for use on hi res CAD applicatons.
Complete with tilt and swivel base. **£849(a).**

EXPANSION SYSTEMS

RISC OS (305/310/440)	£29(b)
RISC OS Prog Ref Manual	£79(b)
Econet Module	£49(c)
Ethernet Card for R140	£449(b)
Floating Processor Unit	£599(b)
RAM UPGRADES	
1Mb RAM upgrade (A3000)	£199(b)
1Mb RAM upgrade (410)	£149(c)
2Mb RAM upgrade (420)	£289(b)
3Mb RAM upgrade (410)	£399(b)
FLOPPY DRIVE UPGRADE	
3.5" Int Drive (305/310/410)	£118(b)
External Drive Adaptor (300/400)	£30(c)
External Drive Adaptor (3000)	£30(c)
External 5.25" Drive 40/80T, psu	£90(b)
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Acorn Backplane (2 slots)	£37(c)
TechnoLog Backplane (4 slots)	£39(c)
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I/O Podule	£80(c)
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Acorn ROM podule	£51(c)
CC ROM Podule	£45(c)
IEEE Interface Card	£283(b)
16 bit parallel I/O Card	£195(b)
Dual RS232 Card	£195(b)
WildVision Chromalock Board	£280(b)
Arc Prototypinb Board	£35(d)
Tracker Ball for Arc	£59(c)
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Acorn 20Mb HD + Controller (310)	£449(a)
Techno HD Controller for 2 HD (310)*	209(b)
SCSI HD Controller	£299
Internal ST506 drives for 410 supplied complete with mounting bracket, cables & instructions	
Techno 20 Mb 40 ms	£179(a)
Techno 20Mb 28 ms	£199(a)
Toshiba 40 Mb with Auto park 25 ms	£329(a)
Techno 40Mb 28 ms	£299(a)
Techno 49Mb 28 ms	£369(a)
External ST506 HD as 2nd HD	
20Mb (cased & psu, cables)	£249(a)
40Mb (cased & psu, cables)	£359(a)
49Mb (cased & psu, cables)	£439(a)
Enquire on prices for SCSI drives	
CABLES:	
Arc BBC Serial Link inc software	£15(d)
Arc/BBC Serial Cable	£7(d)
Arc PC Serial Cable	£7(d)
Arc Parallel Printer lead	£7(d)
Arc Keyboard Extn lead	£7(d)
Arc Scart Lead	£7(d)
Arc/CM8833 lead with audio jack	£10(d)
ARC Dust Cover	£8.50(d)
High Quality Mouse mat	£4(d)

AEDA

External Drive Adaptor: A versatile external drive adaptor offering many novell features:
Professionally desgned for easy and neat installation.
Fully buffered and handles a total of 4 drives (3.5" or 5.25").
Rear panel mounted switch to select internal or external drive as boot drive. Particularly useful with PC programs.

AEDA for 300/400 Series **£30(c)**
AEDA for A3000 (1 rear plate) **£30(c)**

TRACKER BALL NEW

A sturdy, high quality tracker ball is now available to replace the Archimedes mouse. You will no longer run off your mouse mat and at the same time you can save the valuable desk space. The tracker ball is fully compatible with the Arc mouse driver. **£52(c)**

Archimedes Software

LANGUAGES & PROG. TOOLS

ANSI C/ISO PASCAL/ FORTRAN 77	each £95(c)
PROLOG X/LISP	each £175(b)
TWIN Editor	£27(d)
Archimedes Assembler	£185(b)
Software Dev. Toolbox	£185(b)
RISC BASIC Compiler (SV)	£85(c)
Chares Toolkit	£32(d)
Clares Toolkit+	£41(d)
Acorn Desk Top Publishing	£125(b)

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1st Word Plus	£79(c)
Graphics Writer	£27(d)
Pipedream	£89(c)
P. Spellchecker	£43(d)
Pipedream Ver 3 (inc Spelling checker)	£129(c)

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Logistix	£95(c)
Sigmasheet	£57(c)

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System Delta Plus	£57(c)
System Delta Plus Prog Ref Manual	£25(d)
Reporter*/Mailshot*	each £33(d)
School Administrator	£125(b)
Alphabase	£37(d)

**Requires System Delta plus*

ACCOUNT SYSTEM

MMMM inerva's Suite* **each £54(d)**
(Order Processing/Sales Ledger/Stock Manager/ Purch. Ledger/Nom. Ledger)
**Requires System Delta plus*
Home Accounts **£41(d)**

NEW PRODUCTS

technoSCAN Scanner 200dpi £149(b)
Genius Digitising Tablet £259(a)

GRAPHICS/ART/CAD

Pro Artisan	£137(b)
Artisan	£30(d)
Artisan Support Disc	£17(d)
Atelier	£90(b)
Auto Sketch	£55(c)
Gamma Plot	£52(d)
Render Bender	£59(b)
Graphbox	£64(c)
Armadeus	£65(c)
Presenter	£24(d)
SVARC-PCB	£167(b)
SV Solid CAD	£41(d)
SV Super Dump	£20(d)
Sv Real Time Solids Modeller	£75(c)

MISCELLANEOUS

PC Emulator	£79(d)
HEARSAY Comms Package	£55(d)
MAYA Terminal Emulator	£29(d)
Control (setup utility)	£13(d)
(inc VT52, ANSI, Tektronix 4034, Kermit protocols)	
Arcomm	£29(d)
Presenter II	£POA

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VIEW/Viewsheet/Viewstore	each £47(d)
Interword/Intersheet	each £35(d)
Wordwise	£20(d)

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Zarch	£15(d)
Conqueror	£24(d)
Enthar Seven	£29(d)
Minotaur	£9(d)
Clares 3 Pack	£12(d)
Viking	£17(d)
Thundermonk	£12(d)
Corruption	£20(d)
Pacmaria	£16(d)
Terramex	£16(d)

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technoSCAN

A versatile hand held scanner for Archimedes offering four monochrome resolutions (100, 200, 300 & 400 dpi) as well as having 4 different modes of operation to select gray scaled or monochrome images.
Software is fully integrated with the multi-tasking RISC OS and utilises the desktop environment to facilitate easy incorporation of scanned images into RISCOS compatible DTP, WP, art or drawing package.
The scanning area is 4" wide and vertical height is limited only by memory constraints. The image brightness is adjustable to obtain the optimum quality. Tone selector allows different settings for text and photos.
Software appears as an icon on the icon bar from where all its facilities can be accessed. Software features include:
Visual rescaling of either X or Y axis, X & Y flips, colour tinting, picture cropping, on screen help, etc. RISC OS's anti aliasing feature is utilised to enhance the image quality.



Scanned images can be saved as sprite file or dragged into other applications. The images can be output to compatible printer as a sprite using one of the RISC OS versatile printer drivers.
The manual is written in easy to follow style with hints and tips for getting the best results. The manual together with interactive on-screen help gets you going almost immediately you have installed the scanner. On screen warning appears if the image is being scanned too fast. Real time scanning would normally be used to setup the various controls for the best results and then off screen scanning would be carried out for the final scan to ensure uneven scanning speed does not leave tell-tale lines of lost data on the image.

***techno*SCAN complete with interface card and manual** **£149(b)**

Genius Digitising Tablet

Latest model of Genius GT1212A PC tablet adapted for use with Archimedes offers resolution of 1000 lines/in over a 12" × 12" working area and connects through the serial port of the computer.
Tablet is supplied with a four button puck controls, an optional two button stylus with switched tip is also avaiable.
The software to drive the tablet is supplied as a module to operate within the RISC OS desktop environment. Once loaded several commands are available to control the tablet, ie commands to turn it on or off, to select relative or absolute coordinates etc. Three puck buttons act as standard mouse buttons and the fourth allows special operations like changing the size of the tablet work area.
The tablet can virtually take over all the functions of a mouse making the use of graphics packages much simpler. The option stylus will make tracings, line drawings etc much easier and more accurate.

GT1212A Tablet	**£259(a)**
Optional Stylus	**£35(d)**

MULTI I/O Podule

A low cost card provides: **Video Digitiser, Sound Sampler,** a full RS232 interface, 3 ROM skts & joystick interface within RISCOS environment.
Details on request. **£117(b)**

MASTER SERIES

AMB15 Master 128 **£439(a)**

The Master package includes: ***View Word processor and Viewsheet spreadsheet software and EITHER Educational/Fun software bundle with STARdataBASE package.***

ADC06 Turbo 65C102 Module	**£115(c)**
ADF10 Econet Module	**£49(c)**
Acorn Rom Cartridge	**£13(d)**
ADJ22 Ref Manual I	**£14(c)**
ADJ23 Ref Manual II	**£14(d)**
TRC32 32K RAM Cart.	**£15(d)**
Master Dust Cover	**£4.75(b)**
Universal CoProc Adapter	**£49(b)**
BBC Domesday System	**£2,500(2Xa)**

ECONET ACCESSORIES

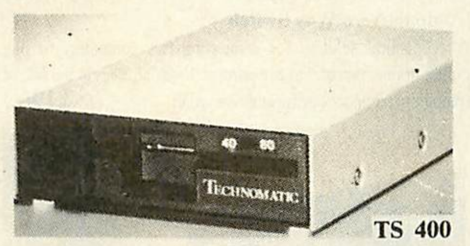
Stacking Filestore EOIS	**£999(d)**
Filestore Hard Disc E40S	**£899(a)**
Filestore Hard Disc E60S	**£1119(a)**
Econet Startet Kit	**£85(b)**
Econet Bridge	**£174(b)**
Econet Socket Set	**£29(c)**
Printer Server Rom	**£41(d)**
File Server Level II	**£75(d)**
10 Station Lead Set	**£34(d)**
Master FS Utility Disc	**£17.25(d)**

Special schemes exist for teachers to purchase Archimedes A3000. Please contact us for details



TECHNOMATIC DISC DRIVES

A range of high quality high performance drives to meet the needs of all BBC Micro Users.
*All drives are fitted with high quality slim line ultra low power mechanisms capable of single and double density operation and offering fast track access and head setting times.
*5.25" floppy drives are fitted with 40/80 track switches as standard at no extra cost. The switches are located in the front and clearly marked to indicate the status at a glance.
*All drives fitted with all necessary leads and are ready for operation on unpacking. The drives with the mains power supply are supplied with a mains lead fitted with a suitably fused 13A moulded plug.
*Our plinth drives have been thoughtfully designed and provide a choice of two 5.25" drives or a combination of 5.25" and 3.5" drives.



TS 400

PD 800P

5.25" Single Drives 40/80 switchable:

TS400 400K/640K	**£80(b)**
PS400 400K/640K with integral mains power supply	**£90(b)**

5.25" Dal Drives 40/80 switchable:

TD800 800K/1280K	**£160(a)**
PD800 800K/1280K with integral mains power supply	**£170(a)**
PD800P 800K/1280K with integral mains power supply and monitor stand	**£185(a)**
PD800 Case with psu & data cable	**£42(b)**
PD800P Case with psu & data cable	**£75(a)**

PS400/PS351 are Compact/Archimedes compatible.

PD800/PD352/PD853 are Archimedes compatible.

3.5" 80T DS Drives:

TS351 single 400K/640K	**£69(b)**
PS351 3.5" single drive with integral mains power supply in a 5.25" case.	**£95(b)**
TD352 Dual 800K/1280K	**£126(a)**
PD352 3.5" dual drive with integral mains power supply in a 5.25" case.	**£139(a)**

Combo Drives (5.25" & 3.5" drives)

PD853	**£170(a)**
PD853 psu and plinth mounting	**£190(a)**

DISC DRIVE MULTIPLEXER
For Master, B, B + and any DFS/ADFS

TDM2 Two computers/one drive unit	**£65(b)**
TDM4 Four comptures/one drive unit	**£115(b)**

WINCHESTER DRIVES

Most popular range of Winchesters for BBC. Drives are housed in metal casing fan cooled and powered by switch mode psu for quiet, efficient and reliable operation.
Front end utility for Master, format and verify program and Tree Plan directory structuring utilities are included as standard.

P30HD 30Mb drive	**£410(a)**
P304HP 30Mb + 40/80T Floppy DS (plinth mounted)	**£609(a)**

UPGRADEs FOR MODEL B

Acorn 1772 DFS Kit	**£49(d)**
ADFS ROM	**£26(d)**
Econet Kit	**£55(d)**
ATPL ROM/RAM Expansion Board	**£37(c)**

3M FLOPPY DISCS

5.25" Discs in packs of 10

NEW LOW PRICES

744 40T SSDD	**£5(d)**
745 40T DSDD	**£6.50(d)**
747 80T DSDD	**£9(d)**
3.5" DSDD Discs	**£9(d)**

BULK DISCS

50 5.25" 40 T single sided discs with sleeves in lockable box.	**£20(b)**
50 5.25" 80 T double sided discs with sleeves in lockable box.	**£25(b)**
40 3.5" 80T DS Discs in lockable box	**£38(b)**
Drive Head Cleaning Kits (5.25" or 3.5")	**£4 (d)**

LOCKABLE DISC STORAGE BOXES

3.5" 40Discs	**£6(c)**	80 Discs	**£7(c)**
5.25" 50Discs	**£6(c)**	100Discs	**£7(c)**

All prices ex VAT and subject to change without notice. See page 6 for Carriage Charges.

TECHNOMATIC

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PRINTERS & PLOTTERS

EPSON

LX800	£145	LQ500	£245
FX850	£285	LQ850	£405
FX1050	£395	LQ1050	£569
EX800	£429	LQ2550+	£919

GQ3500 Laser £1199

NATIONAL PANASONIC

KXP1081 incl Master Lead £139

KXP1124 £269 KXP1540 £435

INTEGREX

132 Inkjet Colour £515

COLOURCELL Inkjet £2750

PLOTTER

Hitachi 672XD A3 4 col £409

Plotmate A4S £379

Plotmate A3M £549

Roland A3 FLATBED PLOTTERS

DXY880A	£510	DXY1100	£625
DXY1200	£865	DXY1300	£1025

All above items are carriage (a).

STAR

LC10	£149	LC10 Col	£199
LC24-10	£269	NB24-10	£449

TAXAN

KP815 £155 KP915 £275

NEC

P2200 £269 P6+ £439

P7+ £579

HP

Laserjet Series II Lazer £1299

Deskjet Plus £569

PRINTER ACCESSORIES

SERIAL INTERFACES

Epson 8143	£32(d)	Epson 8148 (8K buffer)	£79(d)
Nat Pan KXP17	£39(d)	Taxan	£49(d)

RIBBONS

LX80/86/800, MX/RX/FX80/85/800/850	£4(d)
MX/RX/FX100, FX105/1000/1050	£6(d)
LQ500/800/850	£5(d)
LQ1000/1050, EX800/1000 (Black)	£8(d)
EX800/1000	£16(d)
LQ2550, JX80	£13(d)
StarLC10/NL10, NatPan KXP1081	£4(d)
LC10 Colour	£6.50(d)
Taxan 810/815/910/915	£5.75(d)
Integrex Black Cartridge	£10.50(d)
Integrex Colour Cartridge	£16(d)
Juki 6100 £1.80(d) Brother HR15/20	£4(d)
HI80 Pens (4) (Aqueous or Oil Based)	£6.90(d)
Hitachi Pens (6) Aqueous £18.50(d)	Oil £25(d)
Colour option EX800/1000	£35(d)

CUT-SHEET FEEDERS

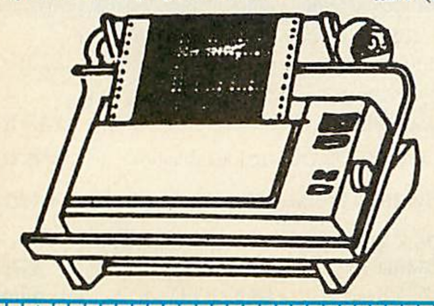
LX800	£70(b)	LQ500	£75(b)
FX/LQ/800/850	£135(b)	FX/LQ1000/1050	£179(a)
EX800	£150(b)	EX1000/LQ2500	£210(a)
Star LC10	£55(b)	Brother HR20	£229(a)

TRACTOR FEEDS

LQ800	£44(b)	LQ1000	£55(b)
LQ850	£70(b)	LQ1050	£85(b)

PRINTER STAND

A new style printer stand with easy paper feed and paper seperation, provides complete access to paper. Can be used with both top and bottom paper feed. Very space efficient. **£26 (b)**

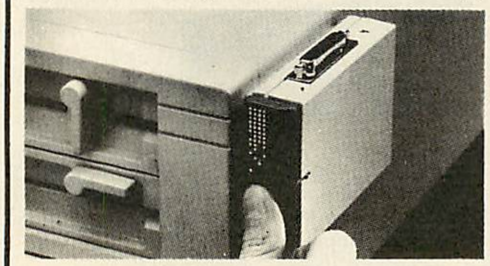


BUFFERS & SHARERS

TSB 256 Auto Sharer/Buffer
256K buffer with 3 input ports. Each port scanned automatically every 10 secs until data found. PAUSE, COPY and RESET Facitilies. Full spec on request. **£169(a)**

Smart Printer Buffer 256K
256K parallel buffer with facilities for 256 copies, PAUSE, RESET & SELF-TEST **£149(b)**

Compact Two Way Switch
A economical solution for connecting two computers to one printer or one computer to two printers. Easily attaches to the side of compute or monitor (specify parallel or serial) **£19(c)**



Manual Printer Sharers:

(All lines are switched).	Parallel	Serial
2 computers to one printer	£23(c)	£23(c)
3 computers to one printer	£30(c)	£30(c)
4 computers to one printer	£36(c)	£36(c)
2 computers to 1 or 2 printers	£49(c)	£49(c)

Cable sets for above sharers available for all popular computers

BBC Computer Sharer: TCS26
1 computer to 2 printers fitted with BBC cable £15(c)

Parallel Printer Leads

BBC/Master (1.2m)	£5(d)	BBC/Master (2m)	£7(d)
Archimedes (2m)	£7(d)	Compact (1.2m)	£7(fd)

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Plain fanfold paper with microperforations:

2000 sheets: 9.5" x 11"	£11(b)
14.5" x 11"	£18 (£4.50)
1000 sheets: A4 80gsm	£11(b)
A4 90gsm	£12(b)
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50 sheets Art paper 115gsm A4 £3(c) A3	£5(c)
100 sheets A4 OHP film	£45(b)

Labels/1000

Single Row 3½" x 1⁷⁄₁₆"	£5(d)
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Triple Row 2⁷⁄₁₆" x 1⁷⁄₁₆"	£5(d)

MONITORS

12", 14" and 20" MONITORS

Microvitec 1431
Std Res, 14" **£175(a)**

Microvitec 1431AP
Std Res + PAL/Aud, 14" **£199(a)**

Microvitec 1451
Med Res, 14" **£219(a)**

Microvitec 1451AP
Med Res + PAL/Aud, 14" **£255(a)**

Microvitec 1441
Hi Res, 14" **£359(a)**

Dust Cover for Microvitec 14" monitors **£5.50(d)**

Philips 8833 14" RGB
Med Res, 14", high contract screen, TTL/Linear input, Mono/Colour Switch Stereo Sound Input. Separate controls for brilliance and contrast. **£199(a)**

Touchtec 501 **£239(a)**

Acorn Philips
14" Colour Monitor **£199(a)**

Microvitec 2030CS
20" Standard Resolution RGB/Comp Video **£380(a)**

Microvitec 2040CS
20" High Resolution RGB/Comp Video **£675(a)**

TAXAN SUPER VISION 625
12" Super Hi Res and contrast RGB Monitor with option to switch to mono BBC/IBM compatible. **£269(a)**

TAXAN 770+
MultiSysnc Autoscan 14", ideal for utilising te hi res modes on Archimedes. Our price includes a tilt & swivel stand **£419(a)**

VIKING II
19" Hi Res white screen monitor for CAD applications c/w Tilt & Swivel stand **£849(a)**

CM1686 16"
Hi Res colour monitor for use with hi res modes on 400 series. Res: 1280 x 1024. Complete with tilt & Swivel base **£1249(a)**

MONOCHROME MONITORS

PHILIPS 7502
Hi Res green screen **£72(a)**

PHILIPS BM 7522
Hi Res amber screen **£79(a)**

Tilt & Swivel Stand for Philips Mono **£6(c)**

MONITOR ACCESSORIES

Microvitec Swivel Base (14" plastic monitors)	£10(c)
Monitor Stand Models B & B+	£10(c)
Monitor Stand Master	£13(c)
Double Tier Stand Models B, B+ or Master	£24(b)
Taxan RGB Lead	£7(d)
Microvitec Lead	£4(d)
Monochrome BNC/Phono Lead	£4(d)
Copy Holder Self Supporting A4	£15(c)
General purpose tilt and swivel stand for 12" and 14" Monitors	£12(b)

MODEMS & SOFTWARE

MIRACOM WS4000 V21/V23	£115(b)	Termulator (B/B+)	£25(d)
MIRACOM WS3000 V22	£275(b)	Termulator (M)	£35(d)
MIRACOM WS3000 V22bis	£395(b)	MAYA (B/B+/M/Arc)	£49(d)
PACE LINNET V21/23	£129(b)	Commstar II (B/B+/M)	£28(d)

All modems carry a BABT Approval

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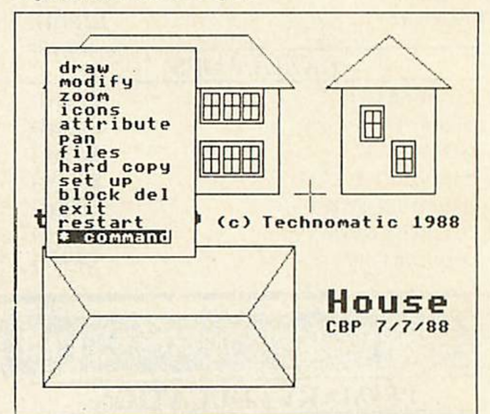


- ★ An easy to use CAD system with pop up menus providing a user friendly interface at all stages of operation.
- ★ Input can be configured for keyboard, mouse or tracker ball. Only three keys to input all commands if input from keyboard.
- ★ Virtually no limit to the size or complexity of the drawing that can be created. Powerful zoom facility allows a A0 size drawing to be viewed from single screen or a single screen can be enlarged to A0 size. Continuous panning across a drawing by specifying co-ordinates.
- ★ Lines, arcs and circles can be drawn with ease and in user defined colour and thickness. These can be modified at any stage of drawing.
- ★ User definable grid and scale, together with on screen display of dimensions, and co-ordinates enable easy and accurate drawings.
- ★ Multi layering capability with 8 levels allows superimposition of drawings.
- ★ Powerful icon utility allows any shape or drawing to be saved to a library as an icon. Icons can be recalled from the library and placed anywhere on the screen drawing at required scale and orientation.
- ★ Toolkit program allows customisation of files, utilities and peripherals.
- ★ Drawings can be scaled on screen to suit the plotter or printer in use. A maximum resolution of 0.01mm is available. Pre-configured drivers for many popular plotters and a driver generator for any BBC compatible plotter is included. Printer drivers for Epson 9 pin and 24 pin printers are included as standard as is the facility for installing drivers for other printers. Printers will output in landscape or portrait format.

FREE EVALUATION DISC AVAILABLE
Phone for your copy
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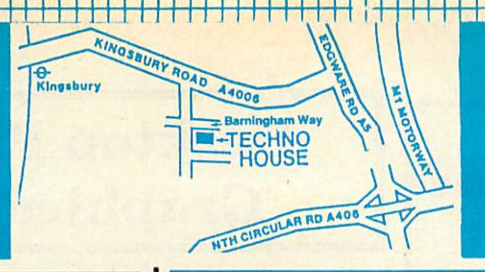
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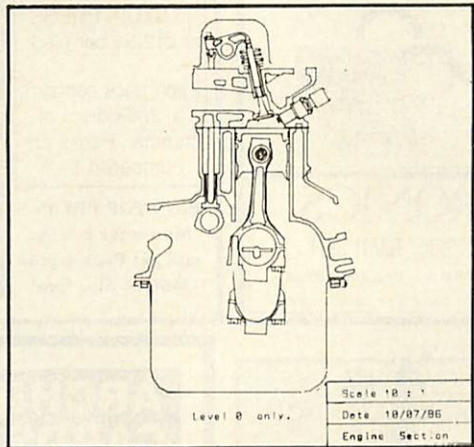
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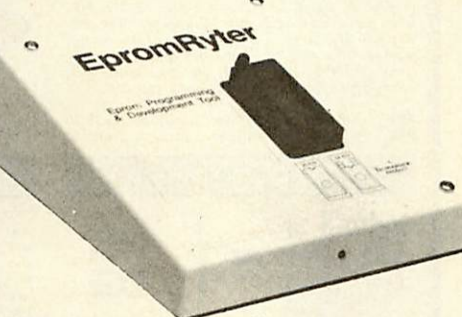
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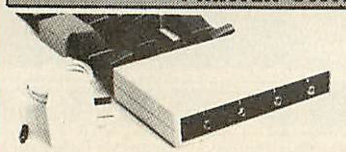
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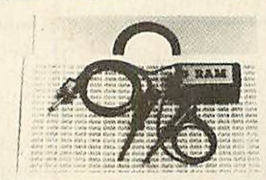


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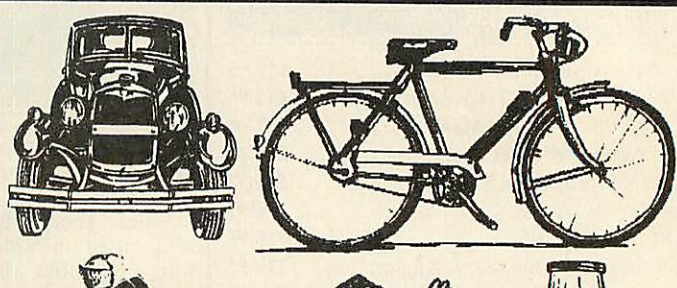
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- Sound Sampler Stereo/Midi (Armadillo) £186
- Chromalock Podule £280
- Econet Network Board £49
- Archimedes IEEE Interface Adaptor £269
- Dual RS232 Podule £195
- 16 bit parallel I/O Card £195
- NEW – Archi MK II Replacement Mouse £39
- PC Emulation Pack incl. MSDOS 3.21 £52
- Software Developers Toolbox £175
- Floating Point Unit £549
- SCSI Adaptor Expansion Card £275
- Archi Logotron LOGO £55
- Archimedes RISC-OS Reference Manual £79
- Arm Assembly Lang. Prog. Manual £15
- Archimedes BBC Basic Guide £20

Convert your Archi 410 to a 420 or 440 with Watford's unique Upgrade Kits

UP10 – 1MB RAM + 20MB H' Disc	£299
UP20 – 2MB RAM + 20MB H' Disc	£499
UP30 – 3MB RAM + 40MB H' Disc	£679
UP40 – 3MB RAM + 53MB H' Disc	£795

(P.S. When purchased with an A410/1, the upgrades will be fitted at no extra cost)

GRAPHICS, ART, DESIGN & GAMES

Atelier	84	Autosketch	£69
Artisan	£31	Zarch	£16
Pro Artisan	£140	Conqueror	£19
Support Disc	£16	Missile Control	£13
Toolkit (Beebug)	£32	Enthar Seven	£29
Toolkit (Clares)	£42	Lingenuity Presenter	£24
Alerian	£12		
Minotaur	£11	Freddys Folly	£12
Kermit	£46	Hoverbod	£12
Archeffect	£20	Ibix the Viking	£16
ArcTFS	£25	Jet Fighter	£12
Render Bender	£66	Orion	£12
Graphbox	£64	Packmania	£16
Gamma Plus	£60	Repton 3	£18
Graphic Writer	£23	Thundermonk	£12

0% FINANCE

We are once again able to offer 0% finance for the purchase of an Archimedes Micro and some peripherals. For further details please write in or telephone

0923 37774 ext 203, 202 or 201

MINERVA's Archimedes Software

Sigmasheet	£57	System Delta+	£69
Deltabase	£24	Sales Ledger*	£53
Home Accounts*	£42	Purchase Ledger*	£53
Stock Manager*	£53		
Nominal Ledger*	£53	Reporter	£20
Ancestry	£59	Mailshot	£33
Gammaplot	£57		
System Delta + Reference Manual			£25
Order Processing/Invoicing*			£53
School Administrator			£66

*** Requires System Delta**

(P&P on above items £2)

Archimedes RAM Upgrade

All our memory upgrades are simple to fit. No soldering required.

- A3000 Watford 1MB RAM Upgrade £159
- A3000 Watford 4MB RAM Upgrade £449
- A305/310 2Meg RAM Upgrade £325
- A305/310 4Meg RAM Upgrade £549
- A410/1 RAM Upgrade to 2 MB £149
- A410/1 RAM Upgrade to 4 MB £399

(Carriage on Add-ons £3)

FINANCE AVAILABLE

In these days of expensive borrowing, we are pleased to have negotiated a special low rate finance deal for our customers, with flat interest rate of 12.25% per annum, typical APR 25.5%.

In addition to the above, we are able to offer all Archimedes and BBC Master computers as well as selected hardware on a 0% interest free finance deal.

For further details of finance terms please write or telephone 0923 37774 ext 223/201.

By popular demand, we are now supplying refurbished and fully guaranteed BBC Micros with Disc Filing System

(Please telephone for price & availability)

WORDPROCESSORS

Wordwise +	£18	Pipedream	£89
Image Writer	£25	P. Spellchecker	£40
Interword ROM	£35	View	£49
1st Word Plus	£75	Viewspell	£32
Archie Spell Master	£39	ViewIndex	£12

DATABASES

AlphaBase	£39	Flying Start II	£80
Viewstore	£49	System's Delta+	£60

SPREADSHEETS

Intersheet ROM	£35	Viewsheet	£49
Sigmasheet			£59

BUSINESS GRAPHICS

GammaPlot	£59	Interchart ROM	£25

INTEGRATED PACKAGES

Logistix – Database, Spreadsheet, Time Management & Business Graphics £94

Pipedream 3 – Wordprocessor, Database & Spreadsheet £135

(P&P on above £2)

Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.

Only £15

Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. NO SOLDERING is involved. Supplied complete with necessary lead.

Only £21

Watford's 20Meg & 40Meg Archimedes Hard Disc

Watford Electronics' 20Meg & 40Meg hard disc fits internally into the Winchester slot provided. It is fully compatible with Acorn's hard disc upgrade, (the only difference is our low price). Price includes the Hard Disc Drive, Controller Podule & fitting instructions.

P.S. The 310 upgrade requires a backplane and a fan.

- 3HDP – Hard Disc Podule only £249
- 3HD20 – 20Meg Hard Disc for 310 £329
- 3HD40 – 40Meg Hard Disc for 310 £399
- 2 Podule backplane (Watford) £25
- 4 Podule backplane (Watford) £38
- Fan for the backplane £9
- 4HD20 – 20Meg Hard Disc for 410 £179
- 4HD40 – 40Meg Hard Disc for 410 £299
- A3000 Hard Disc Podule only £TBA
- A3000 20 Meg Hard Disc £TBA
- A3000 40 Meg Hard Disc £TBA

(Carriage £7)

LANGUAGES (Archimedes)

ANSI 'C'; ISO-PASCAL; FORTRAN 77; all Release II.	£94 each
Assembler; LISP or Prolog X	£180 each
LOGOTRON LOGO	£55
BASIC Compiler	£89
TWIN EDITOR	£27

(P&P £2 on above packages)

BBC MASTER

MASTER 128K Micro incl. Acorn's: View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus FREE OFFER (see below) **£439 *(carr £7)***

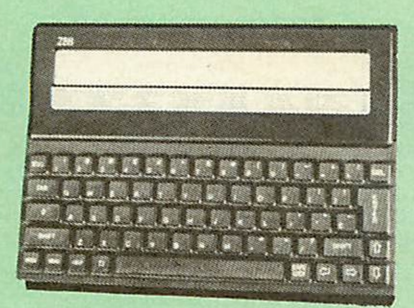
FREE... FREE... FREE...
Hardware and Software OFFER
AMX Mouse Mk III & SuperArt
plus
Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control. With every BBC Master purchased from us this month.

ADD-ONs & ACCESSORIES

Turbo 65C102 Add-on Module	£118
Econet Module for the Master	£49
Twin ROM Cartridge for Master	£8
Quad ROM Cartridge for Master	£12
Universal Processor Adaptor	£75
Master Reference Manual I	(No VAT) £14
Master Reference Manual II	(No VAT) £14
Master Advance Ref. Manual	(No VAT) £17
64K Upgrade Kit for B+	£32
Acorn 1772 DFS Kit complete	£49
ECONET Upgrade Kit for BBC B	£42
ALL ECONET UPGRADES Available	
ARIES' IEEE Interface for BBC B & Master	£238
Morley Teletext Adaptor with ATS Rom	£99
Filestore E01S £899 / Filestore E40s	£799
Filestore E60S £1080 / Ecolink	£270

(Carr. £2 to £7 depending on the weight)

Z88 Portable Micro



Watford Electronics are the largest Z88 Dealer in the UK

Only: £195 (Carr £4)

FREE
With every Z88 purchased from us this month, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

ACCESSORIES

32K RAM Pack or 32K EPROM Pack	£17.35
128K RAM Pack or 128K ROM Pack	£43.40
512K RAM Pack	£169
Z88 Eprom Eraser Unit	£34.75
Z88 Pipedream Spellcheck (Colton)	£52
Z88 Spellmaster for Pipedream	£51
Z88 Carrying Case	£8.50
Z88 Computing Book	£9.95
AA Nicad Rechargable Battery	£1.50
Battery Charger Compact & Fast	£6
Z88 Serial Printer Cable	£8.65
Z88 Parallel Printer Cable	£24.00

● Z88 to BBC Link	£22	● Z BASE	£56
● Z88 to PC Link II	£30	● Z TAPE	£42
● Z88 to Macintosh	£49	● Z TERM	£42
● Z88 Mains Adaptor	£8.65	● Z88 Modem	£145

NEW

Archi Mk II Hand Scanner



Watford Electronics is now able to offer a complete hand held scanning package, possibly the most essential addition to any desk top publishing system. The package includes the most comprehensive utility software available for the Archimedes, a high quality, ergonomically designed to fit the shape of your hand, (see drawing above) scanner, which is fitted with a warning LED that will indicate if the scanner is being moved too quickly for accurate results. Additional twin guide rollers ensure precise tracking over the image, to make the best use of the high resolution available with this system. The yellow/amber illumination of our Mk II scanner, enables you to achieve optimum accuracy.

SCANNER

The scanner is capable of scanning up to an amazing 400 dots per inch (DPI)! The scanning area is 4" wide, and the height is only limited by the maximum amount of memory available. The dot resolution may be switched to 100, 200, 300 or the maximum 400 dpi. One of four operating modes may be selected offering either pure monochrome scanning, or one of three grey level modes. The grey level modes use different size dither patterns to represent up to 16 shades of grey. There is also a dial to allow the "brightness" to be adjusted over a wide range, in order to optimise the quality for any specific image. The scanner interface is a standard, single width, expansion card (podule) which plugs into the Archimedes' backplane. The socket on the rear panel connects the scanner by 1.8 metres of cable.

SCANNER SOFTWARE

Full use is made of the windowing and the multi-tasking facilities of RiscOS. The software is supplied in a 64Kbyte ROM located on the interface board. The scanner appears as a small icon on the desktop icon bar, and the software is retrieved from the ROM simply by clicking on that icon. As you scan a page, the image appears in the scanning window on the screen, scrolling up in real time. The other facilities included in the software are.

Cropping and scaling to any size including stretching and squashing in X and Y directions separately.
Colour tinting.
X and Y flip.
Edge detection which turns solid objects into outlines.
Selective directional copying which allows features (i.e. lines or text) to be made thicker or thinner.

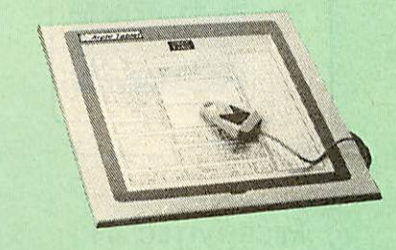
Scanned images may be saved as sprite files or transferred directly into other RiscOS applications (DTP, Draw, Paint) simply by dragging the sprite file into the application's window. Sprites may also be generated using anti-aliasing. This greatly improves picture quality and is particularly effective when scanning material with a range of grey tones, such as photographs. Images can be printed on any printer that is supported by a RiscOS printer driver, with optional settings for portrait or landscape modes, image scale and positioning. Images are printed using the full resolution of the printer and are not limited to the screen resolution.

On-screen help is provided via the RiscOS interactive help facility. Calls are also provided in the ROM for users wishing to write their own software, incorporating the use of the scanner.

Launch offer £149
(P&P £4)

NEW

Archi Graphic Tablet



This package allows Archimedes users to take advantage of the low cost graphpad (sometimes called a digitiser tablet, but not to be confused with a video digitiser!)

The Archi Graphpad offers performance and accuracy comparable to other graphics tablets priced at well over £400, and has the useful addition of a liftable cover, which can hold tracing material or menu templates securely.

The software, which is in the form of a relocatable module (RM), intercepts the system calls which control the mouse, and so allows virtually all mouse based Archimedes software to be controlled using the tablet without any modification. The only exceptions are programs which use the serial port, as the tablet is physically connected to this post itself.

Graphics programs such as Artisan, Pro Artisan, AutoSketch, Oak DTP, and the RiscOS Draw, Paint and DTP packages are considerably enhanced by the use of the graphics tablet as opposed to the mouse, although it can, of course, be used with any other mouse driven application.

The software allows the user to define how much of the tablet's 12" x 12" working area to use, allowing very fine control when drawing freehand or tracing from a variety of differently sized drawings, diagrams, photographs, etc.

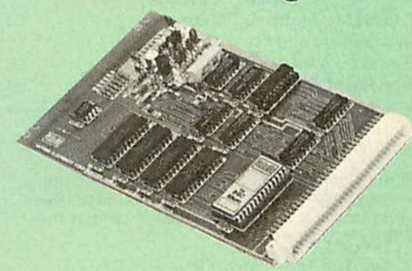
The tablet driver is compatible with all Archimedes machines, and with both Arthur and RiscOS operating systems.

The pointer is moved via a four button puck complete with transparent lens and crosshairs for optimum accuracy. Three of the buttons emulate the Archimedes mouse buttons precisely, the fourth being used for special functions such as setting the position and size of the active working area. The buttons may be re-mapped to allow the relationship between tablet and mouse buttons to be redefined, should this be required.

The software is supplied with a special adaptor lead to connect the tablet to the Archimedes' serial port, and a power lead which plugs onto the Archimedes' main board.

Launch Price £259
(Price includes Tablet, leads and software)
(P&P £4)

Archimedes Real-Time Digitiser



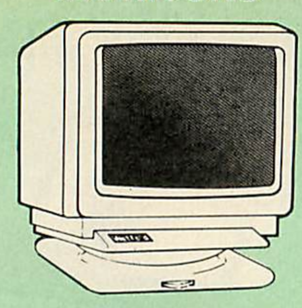
Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Please write in for further details.

Price £249

Continued


MONITORS



MICROVITEC 14"

- **1431** – Standard resolution as used on the BBC television computer programme £175
- **1451** – Medium resolution, suitable for word processing in mode 0 £219
- **1441** – High res, exceeds the capabilities of the BBC micro £359
- **1431AP** RGB + PAL and AUDIO £199
- **1451AP** RGB + PAL and AUDIO £255
- **2030 CS** 20" Med Res £399
- **2040 CS** 20" Hi Res £675
- Dust Cover for Microvitecs £5.50
- **Touchtec 501 Touch Screen £239**

14" MULTISCAN COLOUR

- **TAXAN** Multisync 770 Plus £425
- **TAXAN** Multiscan 870 16" Monitor £575
- **TAXAN** Viking 19" Paper White, High Resolution (1152 x 896 with Archi 400 series) £799
- **EIZO** 8060H – For technical info. read the review in Micro User, Jan. '89 £429
- **EIZO** 9060S Super High resolution multiscan monitor for a wide range of applications. 800 dots x 600 lines. Display for high res VGA. 0.28 Dot pitch £469

TAXAN 12"

- Super Vision 3 – **Type 625** Super Hi-res RGB Colour, Green/Colour Switch £269
- KX117 – Hi-Res Green Screen Monitor £79

PHILIPS

- **BM7502** 12" Hi-res Green Monitor £64
- **CM8833** 14" Med. Res Colour Monitor £195

STAR BUY

- **PHILIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £189

Dust Cover for Phillips Monitors £6
(Securicor carriage on Monitors £7)

SPARE LEADS

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for TAXAN Monitors	£3
Archimedes Colour Monitor Lead	£7.50

SWIVEL BASES

By simply placing your monitor on one of our front adjustable professional swivel bases (see drawing at the top), you can easily adjust the monitor viewing angle.

for 12" Monitors **£8** (carr. £2.50)
for 14" Monitors **£12** (carr. £2.50)

Anti Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for wordprocessor users.

Price £12

PLOTTERS

- Plotmate A4S £379
- Plotmate A3M £549

Roland Plotters

(Official Roland Appointed Distributor)

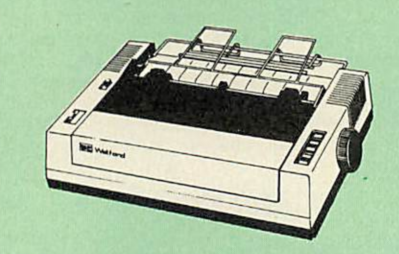
- **DXY 880A £560**
- **DXY 1100 £630**
- **DXY 1200 £879**
- **DXY 1300 £1035**

TAXAN KP-815 PRINTER

Offer Price £149

Taxan KP915 132 Column	**£275**
RS232 Interface	£49
RS232 Interface with 2K Buffer	£69
RS232 Interface with 16K Buffer	£89

Panasonic KX-P1081



UK's most popular printer.

SALE OFFER only: **£135**

Optional RS232 Interface: £39
(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

KX-P1180 Printer Offer

Panasonic KX-P1180 printer, Dump Out 3, Screen Dump ROM & a BBC printer Lead.

Offer Price £146

Panasonic Printers

- **KX-P1124** 24pin 80col. 192/63 CPS £245
- **KX-P1180** 9pin 80col. 144/38 CPS £146
- **KX-P1540** 24pin 136col. 240/80 CPS £435
- **KX-P1592** 9pin 136col. 216/45 CPS £275
- **KX-P1595** 9pin 136col. 288/61 CPS £355

- **Panasonic KX-P4450** LASER PRINTER Latest technology at Watford's special offer price £1,349
  - Spare Toner £29
  - A4 Feeder £55
  - Drum Unit £149
  - Developer £115

Panasonic Accessories

Cut Sheet Feeders

KX-P1592/1595 (P32) £175; KX-P1540 (P35) £185
KX-P1124 (P36) £88; KX-P1180 (P37) £79

BUFFERS

P12	4K Buffer Board for 1081	£55
P42	32K Buffer Chip for 1592/1595	£25
P43	32K Buffer Chip for 1540/1124	£25

Serial Interfaces

P17 P1081/1592 £32 P19 P1124/1180 £55

Original Panasonic Ribbons

Guaranteed to last 3 million characters
P110 for KX-P1081; 1592 & 1595 £8
P115 for KX-P1180 £8 P145 for KX-P1124 £8
P140 for KX-P1540 £10
Colour Ribbons for KX-P1081, 1592 & 1595
Brown, Blue or Red £9.95 each

INTEGREX COLOUR JET

- Colour Jet 132 Printer £515
- Paper Roll £6.50
- Screen Dump Software £10
- Colour Cartridge £16.50
- Black Cartridge £10.35
- 100 A4 OHP transparencies £55
- 8K Serial Interface Optional £123

NEW – Intergrex COLOURCEL NPQ Ink Jet Colour Printer £2,695

NEC P2200 PINWRITER

24 pin; 80 column; 168CPS – 56CPS LQ; Epson LQ compatible, 7K Buffer; 7 resident FONTS, Friction & Tractor feed, front load single sheet feed, etc.

£249

Pinwriter Serial Interface (optional)	£55
P2200 Cut Sheet Feeder	£59
Additional Font Cartridge	£25
P2200 P2200 Spare Ribbon	£6
P2200 Dust Cover	£5

NEC PINWRITER P6/P7 Plus

NEC P6+ 80 columns £439 NEC P7+ 136 columns £575
Colour Option £74 Serial Interface £73
Cut Sheet Feeder £125
NEC Ribbons for P6 £8; P7 £9.50

Payment may be made by credit card, Connect card or cheque, but we also have available a range of finance terms, see the feature in our advert.

Star Printers

Star LC10	£139	LC10 Colour	£185
Star LC24-10	£205	XB24-10 Colour	£425
NB24-10	£425		
LC10 Colour Ribbon			£6
Cut Sheet Feeder			£65

EPSON PRINTERS

EX800	£410	LQ550	£245
EX1000	£564	LQ860 Colour	£539
FX850	£279	LQ1050	£549
FX1000	£425	LQ1060	£679
FX1050	£395	LQ2500+	£839
FX1060	£679	LQ2550+	£895
LQ500	£239	LX800	£135
LQ550	£245	LX400	£139
GQ3500 Laser	£1150	SQ2500	£899
LQ850	£405		

CUT SHEET FEEDERS for

EX800 **£149**; FX800/LQ800 **£149**; FX850/LQ850 **£149**; FX1000/LQ1000 **£179**; LQ500/LX800 **£79**; LQ1050 **£175**; LQ2550 **£390**.

TRACTOR FEED for

LQ800 **£44**; LQ850/FX850 **£69**; LQ1050/FX1050 **£85**; LQ2500 **£90**; LQ2550 **£90**

ACCESSORIES

- EX800/1000 Colour Option £55
- EX800/1000 Colour Ribbon £18
- LQ2500 Colour Option £65

(Securicor Carriage on Printers £7)

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	£32	RS232 + 2K Buffer	£52
IEEE 488	£40	RS232 + 8K Buffer	£79

PRINTER LEADS

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 1 meter	£6
Nimbus Centronics Lead	£12
IBM Parallel Lead 1 meter	£6
Double Ended 36 way Centronic Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.

Listing Paper (Perforated)

● 1,000 Sheets 9½" × 11" Fanfold Paper	£7
● 2,000 Sheets 9½" × 11" Fanfold Paper	£11
● 1000 Sheets 9½" × 11" NCR 2 Part Fanfold	£19
● 1,000 Sheets 15" × 11" Fanfold Paper	£9
● 1000 Sheets true A4 Fanfold Paper 70gms	£11
● 2000 Sheets true A4 Fanfold Paper 70gms	£19
● Teleprinter Roll (Econo paper)	£4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

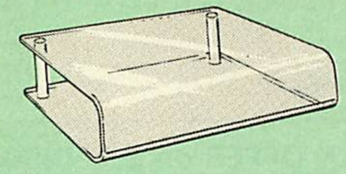
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	£5.00
1,000 90 × 36mm (Twin Row)	£4.90
1,000 90 × 49mm (Twin Row)	£7.50
1,000 102 × 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand. The printer sits on top and the fanfold paper rests neatly underneath, thus occupying the same space as the printer footprint.

80 Column version **£16** (carr £3)
136 Column version **£20** (carr £4)

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

***80 Column version £23** (carr. £3)*
***132 Column version £26** (carr. £4)*

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
Brother HR15/20	£3.00	–
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£3.95	£4.50
RX/FX80/MX80	£3.00	
DMP2000	£3.75	£4.75
EX/LQ800	£4.50	£4.50
EX/LQ1000	£7.50	£5.00
RX/FX80/85/800/MX80	£3.90	–
RX/FX100/1000	£5.75	–
Kaga/Taxan KP810/815	£4.90	£5.00
LC10 (Black)	£4.25	£5.00
LQ500/800	£3.75	£5.00
LQ1050/LQ2500	£8.50	£5.50
LX80/86/800	£3.80	£4.50
M1009/GLP	£3.80	£3.75
Panasonic KX1080/81	£4.00	£4.75
SQ2500	£23.00	£5.50
Star NL10	£3.75	£4.50
Olivetti Ink Jet Cartridges (set of 4)	£9	

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Universal Printer Sharers/Changers

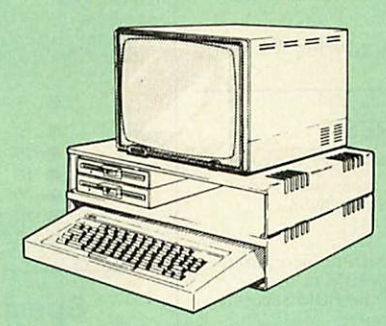
Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spagetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments.)

Connects	Serial	Centronics	P&P
2 to 1	£20	£22	£3
3 to 1	£27	£30	£3
5 to 1	£36	£39	£4

(Cables extra at £6 each. Please specify type required when ordering)

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



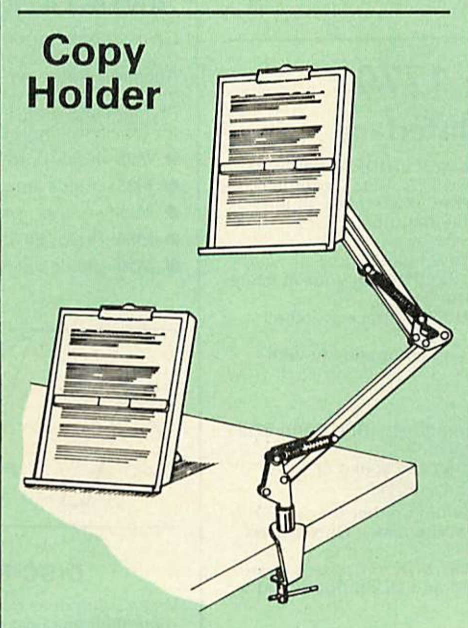
Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	420 x 310 x 105mm	**£13**
Double BBC Plinth	420 x 310 x 210mm	**£24**
Printer Plinth	420 x 310 x 105mm	**£12**
Single Master Plinth	490 x 310 x 105mm	**£14**
Double Master Plinth	490 x 310 x 210mm	**£26**

(Carr. Single plinth £2; double plinth £3)

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£7** (carr. £3)
Angle poise **£12** (carr. £3)

NEW

Handy 2 Way Printer Switch

A handy two way compact printer switch that enables you to connect 2 Micros to 1 printer, or 2 printers to 1 Micro. Attaches easily to your printer, monitor, etc. A low cost solution for educational establishments. Ideal for those wishing to use a dot matrix and a laser printer. Available in two configurations.

Compact AB Switch Centronics	**£20**
Compact AB Switch RS232	**£19**

(Cables extra at £6 each)

MEGABUFFER 256



The Smallest 256K Printer Buffer Unit in the world **38mm x 130mm x 134mm.**

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

Only £149 (carr £5)

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

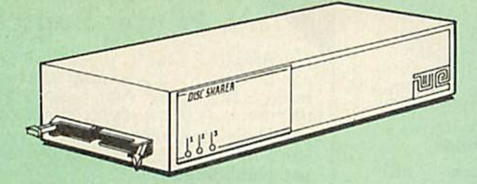
£5.95 (No VAT)



CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

Continued →

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price: **£65** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities then simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's DFSs

Watford's popular and widely acclaimed DFS has now been available for six years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn standard DFS). (while Acorn's 1770 DFS is fully compatible with Watford's Mk II DDFS)***

- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**

(P.S. Our DFS manual is the only comprehensive Manual available for the BBC micro and covers both Acorn & Watford DFSs).

- *DNFS ROM only* **£17**
- *ADFS ROM only* **£25**

(The Single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

NEW

Watford's MkII 1770

Double Density DFS Interface

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features:

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00.**

- SPECIAL PRICE **£44.00**
- DDFS Manual (No VAT) **£6.95**
  - We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.25** Twin CD (with PSU) **£3.90**

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

- *10 × 5.25" S/S D/D 40 Track Diskettes (744)* ***£6.00***
- *10 × 5.25" D/S D/D 40 Track Diskettes (745)* ***£7.00***
- *10 × 5.25" S/S D/D 80 Track Diskettes (746)* ***£11.50***
- *10 × 5.25" D/S D/D 80 Track Diskettes (747)* ***£11.00***
- *10 × 5.25" 1.6M D/S D/D High Density Discs for IBM XT and AT* ***£16***
- *10 × 3.5" S/S D/D 40/80 track Discs* ***£10.00***
- *10 × 3.5" D/S D/D 40/80 track Discs* ***£11.75***
- *10 × 3.5" High Density Diskettes* ***£25***

TOP QUALITY 3.5" & 5.25" DISKETTES

To complement our range of Quality Discs and Disc Drives, WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

- *10 ×* ***M3*** *3.5" D/S D/D 80 Track Discs* ***£10***
- *10 ×* ***M9*** *3.5" Double Side High Density* ***£25***
- *10 ×* ***M4*** *5.25" S/S D/D 40 Track Discs* ***£5***
- *10 ×* ***M5*** *5.25" D/S D/D 40 Track Discs* ***£7***
- *10 ×* ***M7*** *5.25" D/S D/D 80 Track Discs* ***£9***
- *10 ×* ***M8*** *5.25" D/S H/D Hi-Density Discs* ***£14***
- *3" Double Sided Discs* ***£2.50*** *each*

Special BULK OFFER on 5¼" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

PRICES SLASHED

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
Without Sleeves	£35	£39	£45
With Sleeves	£38	£42	£48

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

Price £4

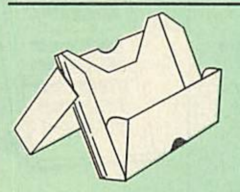
ANTISTATIC LOCKABLE DISC STORAGE UNITS



Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- **M35** - holds upto 50 5¼" discs **£4.95**
- **M85** – holds upto 95 5¼" discs **£6.95**
- **M25*** – holds upto 25 3½" Discs **£4.95**
- **M50** – holds 50 3½" Discs **£6.50**
- **M10** – holds 8 of No. 10 Data Cartridges **£15**

* Not lockable



PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK



When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.
Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds upto eight 5¼" discs.

Protection at Only: **£2**

DISC ALBUMS

Attractively finished in black leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket. **£4**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with an Utilities Disc.

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

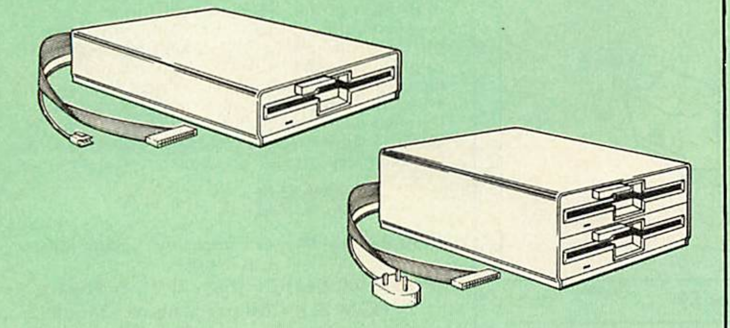
If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

*Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. **Ideal for Schools & Colleges.** We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £18. (At Watford we anticipate your needs of tomorrow, not just today)!*

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 4th page of our advert for the Plinths).

P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



"Test Bureau Approved for Use in Education"

Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
400K (720K)	CLS400S £75	CLD 400 £168	CS 400S £85	CD400 £188
800K (1.44M)		CLD 800S £153		CD 800S £163

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £6 to £7

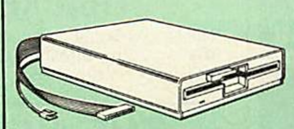
Prefix ***C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

Suffix ***S** = 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13

Special 40/80 Disc Drive/DDFS Mk II Offer



- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both, Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£119** (£7 carr) (Offer valid while stocks last)

3½" DISC DRIVE OFFER

These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Drives to connect to BBC Micros own PSU

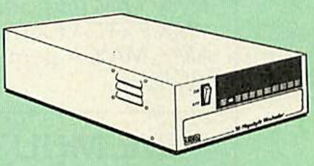
- **CLS35 400K Unit £69**
- **CLD35 Twin 800K £125**

Drives with built-in Power Supply Unit

- **CS35 Single 400K £85**
- **CD35 Twin 800K £135**

(P.S. CS35 Single is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage).

WATFORD's WINCHESTER DRIVES



Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

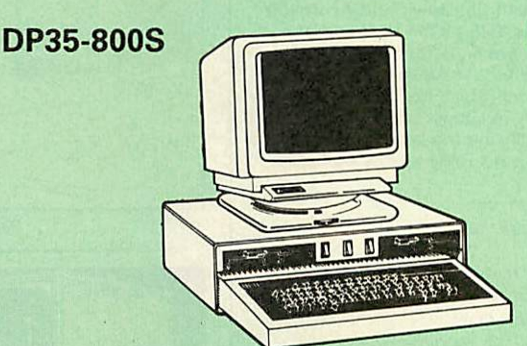
This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a Utilities Disc.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBc B (with 17 X disc interface).

- 30 Megabyte BBC Hard Disc **£369** (carr £9)

DP35-800S DP35-800S



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDPM 800S for the BBC B & Master £179

A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

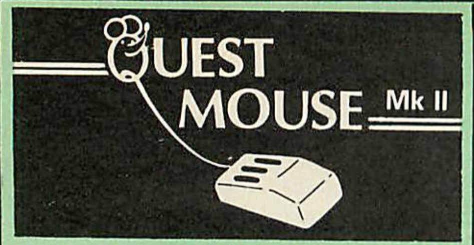
The 5.25" disc drive is 40/80 track switchable. DP35-800S has its own power supply, independent of the BBC Micro.

DP35-800S for BBC/Master £165

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)





- Quest Mouse II & Quest Paint £58
- Quest Mouse II, Quest Paint, AMX Stop Press & Pagefont £89
- Quest Mouse II only £29
- Quest Paint Software only £34
- Quest Font Disc £15
- Quest Mouse Mat (Red or Blue or Green please specify) £3
- Part Exchange your unreliable AMX Mouse for a Quest Mouse for only £22
- GXR ROM for the BBC Micro £22

(P.S. Quest Paint is not compatible with BBC Compact)

N.B.
1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.



Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.
Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

ConQuest ROM Package **£30**
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

NEW
ARCHI Mk II MOUSE
An extremely reliable replacement mouse for Archimedes Micro **£39**

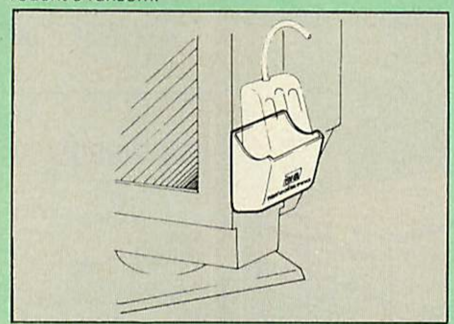
RB2 Marconi
TRACKER BALL

RB2 (AMX/Quest compatible)	£45
RB2 including Quest Paint	£75
RB2-A for Archimedes	£52

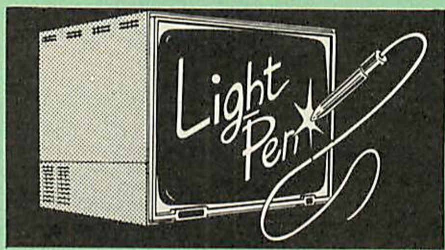
THE NEW Mk III AMX MOUSE
Inc. Super Art package
ONLY: £59 (carr £3)
(Please specify for BBC, Master or Compact)

MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX UTILITY Package	£13
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	£32
PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£13
AMX DESIGN (ROM)	£55
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£15

WE MOUSE HOUSE
Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, Monitor, disc drive or desk.
It protects it from damage when not in use, yet within easy reach when you need it again. There is also a second compartment for your pens and pencils – and at £4 it doesn't cost a rodent's ransom.



Price £4

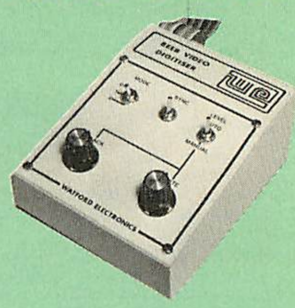


Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted. (Price includes FREE software Disc and Operating Manual)
Only £21

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Software Pack for Compact	£40
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

BEEB VIDEO DIGITISER



"Test Bureau Approved for Use in Education"

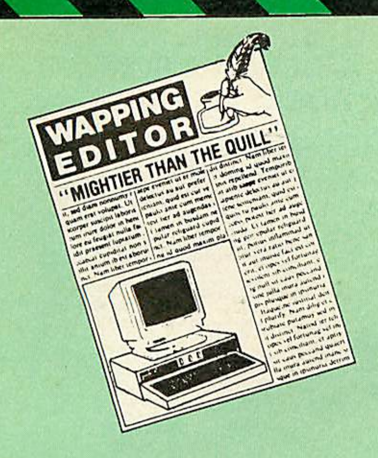
Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.
This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket. Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.
Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.
Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.
A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image. Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £5)

(BBC B+ and Master compatible, except Master with Econet)
(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

Magazine Maker
(As seen on TV)
A combination of Stop Press and Watford's Beeb Video Digitiser.
Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.
They can then be used within Stop Press to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.
With Stop Press's many features, a variety of pictures can be composed – the only limit being the imagination.
Pictures can be doctored using Stop Press's graphics option to produce any number of effects.
Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.
Once created the picture can be printed out.
The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)



The WAPPING EDITOR

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantge of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GXR). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

PAGE LAYOUT SECTION

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine microspacing it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module is a mode 0 version of the highly acclaimed Quest Paint package, detailed elsewhere in our advert, and incorporates all the same drawing facilities, e.g. pencil, brush, airbrush, polygon, circle, ellipse, fill, cut-and-past, etc., etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be – it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

WORD-PROCESSOR

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

THE FONT EDITOR

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designedto take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individually proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.

Upgrading to the Wapping Editor could not be easier since the font editor will convert fonts from other packages, such as Quest Paint or Stop Press (formerly Pagemaker), into Wapping Editor format and a mode conversion utility will convert any screen in modes 1, 2, 4 or 5 into a full grey-scale mode 0 screen. Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser, either independantly or from within the Wapping Editor package.

For convenience all types of file may be stored on the same disc, with the software intelligently and transparently distinguishing between them. Filenames are picked off the screen with the mouse, despensing with keyboard entry wherever possible.

"The Wapping Editor combines sophistication with ease of use and power with simplicity, to make it the most comprehensive and user-friendly DTP system ever likely to be written for the Beeb".

Wapping Editor Software Pack **£69**
Wapping Editor plus Mouse **£89**
(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

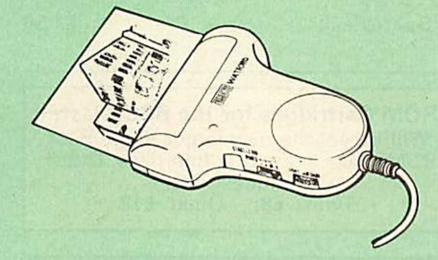
NEW

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games, etc. Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.
Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.
There are two prepared hi-res pages layed out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.
A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routines you can archive large numbers of screens onto a single disc.

£15

The Beeb HandScan
Hand-held Scanner for the BBC Micro



Watford Electronics are pleased to announce the launch of the first hand held scanner for the BBC Micro. HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs! These useful devices have been available for faster and more expensive micros for some time, but only now is Watford Electronics able to offer for the BBC Micro computer.
The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilitiesis provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various type of dithering may be selected to simulate the grey levels of a scanned picture. All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

Beeb HandScan & Firmware **£135**

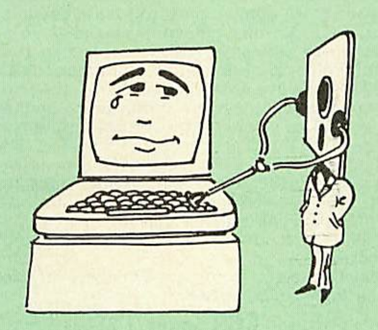
NEW

Wapping Font Disc

Sixteen Wapping Editor fonts including smaller versions of Oberon and Daisy and two new sizes of the standard font.
Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines. Supplied complete with instructions.

£12

DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS432, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

NEW

Beeb DOS 2.2

The BBC and IBM PC's are the most popular micros in the UK. The BBC is firmly established in the education sector and the IBM is the industry standard in the business world. The pools of information and applications held on these computers are immense, yet the means of passing information between them are very limited. Beeb DOS provides a practical method of transferring information between these two micros.
Beeb DOS is a collection of utilities which run on the PC's and enable it to read and write information on BBC discs. You can transfer files between your PC's 360K floppy, high density floppy or hard disc and your BBC discs. In addition Beeb DOS allows you to catalogue, format and compact BBC discs and delete, re-name, lock and unlock BBC files, all on PC's. Each Beeb DOS utility is written in IBM assembler and is run directly from PC or MS-DOS. The Beeb DOS utility can be run from floppy disc, hard disc or RAM drive. Beeb DOS is supplied on an IBM 5.25", 360K disc complete with a comprehensive manual.

Price: £39

(Please write in for technical literature)

Continued




ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£69** (carr. £2)

Aries B-12 Sideways ROM Board

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price: Aries B-12 **£36**
Aries B-12C **£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

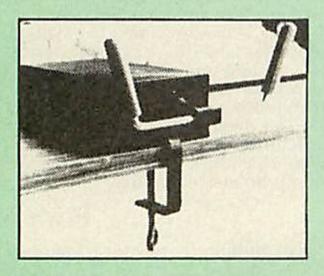
The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

VOLTMACE JOYSTICKS

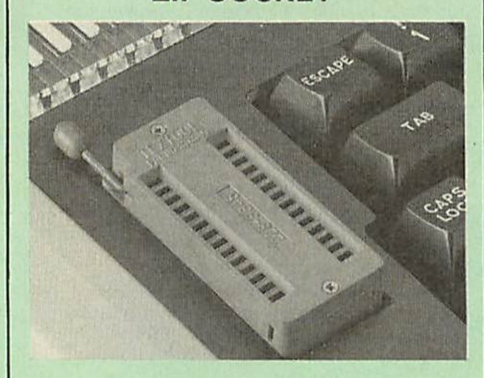
Delta 3B Single Joystick	**£10**
Delta 3B Twin Joysticks	£15
Delta 3C Joystick for Compact	£10
Delta 14B Single Joystick	£11
Delta 14B/1 Adaptor Module	£12
Transfer Software Disc-Tape	£7
Delta-Cat A mouse eliminator Joystick for the Archimedes	£26

Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128 **£25**

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£18** (carr £3)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

- Complete System **£11**
- Spare Cartridges **£2.50**
- Spare Rack **£1.50**

ROM Cartridges for the BBC Master
Will accept the new larger Piggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc.
Twin **£8;** Quad **£12**

16K DISC RAM

(16K Sideways RAM Module)

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.

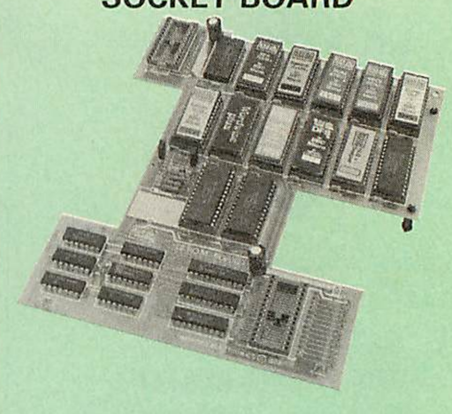
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Compact construction.
- Supplied complete with Battery Backup.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£32** (carr £2)

P.S. 16K Disc Ram Board is not designed to work in conjunction with a Sideways ROM Board.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

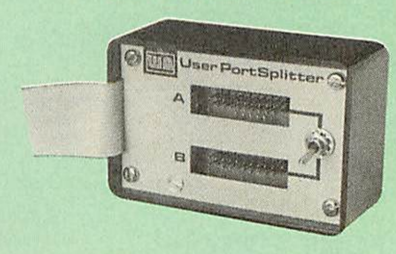
- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35
Battery backup fitted **£39**
Battery Backup only **£3**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

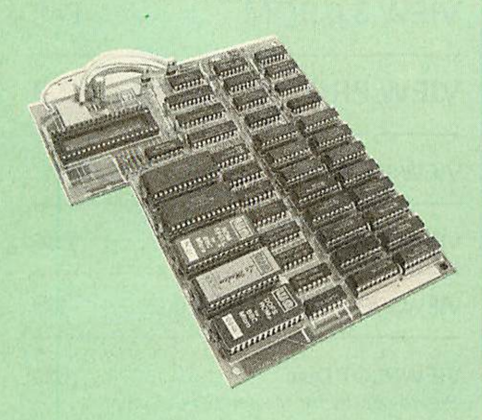
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£22** (carr £2)

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM *£48*
- ROM/RAM card with 64k dynamic RAM *£65*
- ROM/RAM card with a massive 128k dynamic RAM **£109**

(carriage on ROM-RAM Card £3)

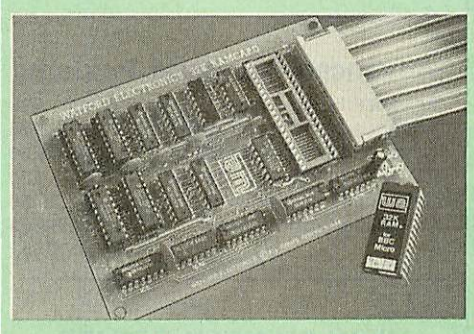
OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit **£10**
- 16k Dynamic RAM for Upgrade **£17.50**
- Battery backup **£3**
- Read and Write protect switches .... **£2 each**

Complete ROM-RAM board All options installed **£115**

P.S.
Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £5 less

32K
SHADOW RAM-Printer Buffer
Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89** (carr £2)

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Payment may be made by credit card, Connect card or cheque, but we also have available a range of finance terms, see the feature in our advert.

BBC SOFTWARE'S Popular Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs **£11.25**
- Maths with a Story 2 (Disc) 4 further maths programs **£11.25**
- Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs **£17**
- RELATIONSHIP: Science (Disc) O Level Biology program. **£20.00**
- BONDING: Science (Disc) O Level Chemistry program. **£20.00**
- ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program. **£20.00**
- ELECTRONICS IN ACTION (Disc) O Level program **£19.95**
- NEWTON & THE SPACE SHUTTLE (Disc) O Level program. **£20**
- ECOLOGY (Disc) O Level program. **£20**
- POLYMERS (Disc) O Level program. **£20**
- Clasification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. **£20**
- FOOD & POPULATION (Disc) O Level program. **£20**
- MICROTECHNOLOGY (Cassette) O Level program. **£11.25**
- A VOUS LA FRANCE (2 Cassettes) A French language home study aid. **£21.70**
- DEUTSCH DIREKT! (Disc & Audio Cassette) **£19.95**
- Modem Master (Disc) **£11.25**
- ADVANCED TELETEXT SYSTEM **£8.65**
- PERIOD TABLE SOFTWARE **£20**
- Astronomy – Primary (Disc) **£12**
- Computers at Work – Primary **£17.35**
- Introducing Geography – Primary **£17**
- **Introducing Geography 11-17yrs** **£17.50**
- Electric Fields 6-14 years **£11.25**
- BlackQueen Contract Bridge **£13**
- Espana Viva – 3 Discs **£19.95**
- A Vous La France Disc **£21.50**

Educational Software

FUN SCHOOL 2 – Red:
Under 6 yrs – 8 programs on Discs, Shape Snap, Find the Mole, Teddy Count, Write a letter, Colour Train, Pick a Letter, Spell a Word & Teddy Bears Picnic.

FUN SCHOOL 2 – Green:
6-8 yrs – Eight programs on Disc, Number Train, Shopping, Maths Maze, Treasure Hunt, Bounce, Packing Caterpillar, 3 Number jump. **£11**

FUN SCHOOL 2 – Blue:
Over 8 yrs – Eight programs on Disc. Build a Bridge, Passage of Guardians, Unicorn, Logic Doors, Souvenirs, Code Boxes, Mystery Machine & Escape. **£11.25**

Versatile **BEEB SPEECH SYNTHESISER** Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued


COMPUTER CONCEPT'S ROMS

ACCELERATOR	£30
CARETAKER Basic Utility	£23
DISC DOCTOR	£28
Graphics ROM	£29
TERMI	£25
COMMUNICATOR	£49

Wordwise £26

Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: £5

SPELL MASTER £42

Inter SHEET ONLY £37

INTER CHART ONLY: £25

Inter-WORD £36

MEGA-3 ROM

Interword, Intersheet & Interchart – 3 in one ROM £76

INTERBASE £49

All Prices Exclusive of VAT

MINI OFFICE II

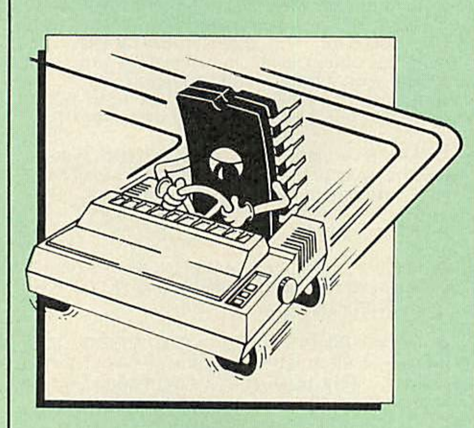
DISC Version for BBC B & B+	£14.00
DISC Version for BBC Master	£16.50
Disc Version for the Compact	£18.00

(When ordering please specify for which Micro & 40 or 80 track Disc).

Advanced Computer Products

Advanced Disc Toolkit	£30
Advanced Disc Investigator	£25
Advanced 1770 DFS BBC	£29
Advanced 1770 DFS Master	£30
Advanced File Manager	£25.00
Advanced Control Panel	£30.00

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

VIEW WORDPROCESSOR 2.1	**£35**
VIEW 3.0 ROM	**£48**
VIEW PROFESSIONAL	**£59**
VIEWSHEET (Acornsoft)	**£36**
VIEWSTORE	**£36**
VIEWSPELL with 80 track disc	**£29**
VIEWPLOT Disc (Please specify for Master 128 or Compact)	**£20**
VIEW-INDEX	**£12**
OVERVIEW Packs 1 & 2	**£69**

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	£8
Juki & Brother HR15 (Disc)	£8
Silver Reed Printers (Disc)	£8

OFFICE MASTER



CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit-ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

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15 Hr Wordprocessing BBC/View	£5.95
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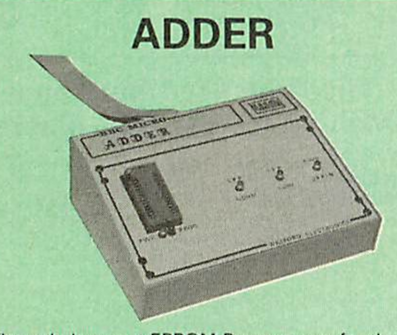


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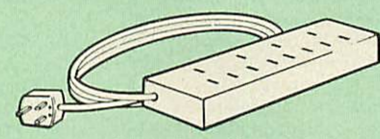
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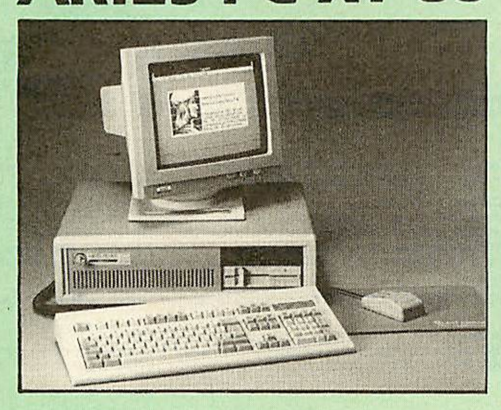
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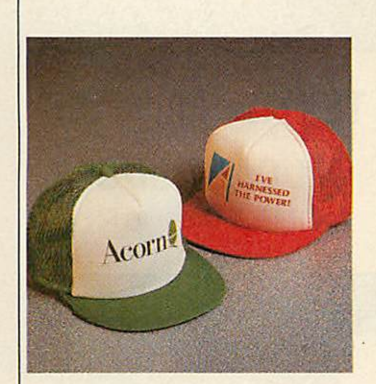
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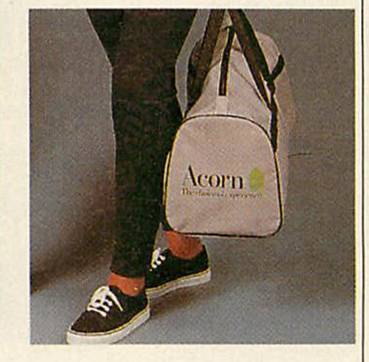
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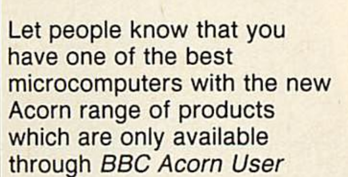
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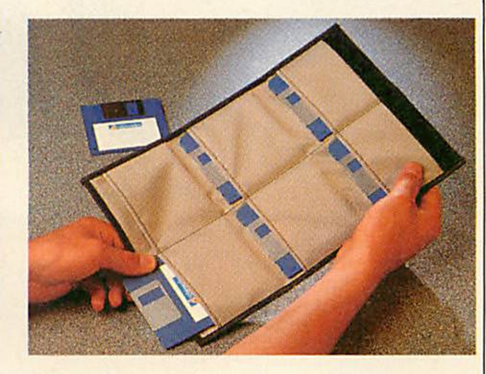
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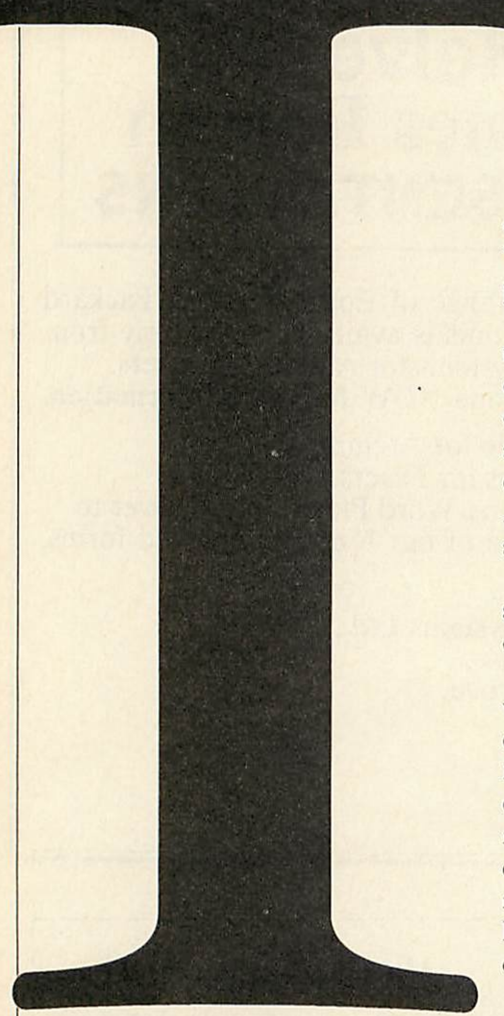
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Typeface design has generally been the preserve of artists and typographers employed by companies like Linotype and Monotype. It is these companies that own typeface designs like 'Times' or the 'Garamond' that *BBC Acorn User* is printed in.

It's ironic that the computer promised, through desktop publishing, to free everyone from the concerns of hot-metal or photo-typesetting. Yet the availability and quality of these typefaces remains one of the hottest topics in DTP. And the Archimedes and its front end system are at the forefront of this debate.

The Arc and A3000 use an 'outline font system' that's quite different from the original BBC micro. How does it work?

One character of a particular font which has to be drawn on screen can be defined in two ways. The simplest method is that used by the BBC micro. Each character is held as a pattern of binary numbers – or bit map – which can be drawn onto the screen by transferring the number pattern into the screen memory. Each bit in the number pattern becomes one pixel on screen, either on or off.

In the model B, the pattern is always eight by eight pixels in size and the patterns are held in the OS Rom. Using VDU 23 you can even create your own eight by eight patterns as user-defined characters. But the patterns need not be equal in size. Dot-matrix printers also hold bit maps for each character and they can be printed in proportional spacing, each character taking up a different width. The Apple Macintosh also uses bit maps for its text on screen. These use the final twist – scalable bit maps. The Mac holds bit maps for a few different sizes of text, often just 8pt, 10pt, 12pt, 14pt, 18pt and 24pt. To draw 11pt text on screen, it mathematically enlarges the 10pt pattern.

The bit maps held by the Mac or a similar system can be finely tuned for the best appearance on screen but they result in very messy lettering for the sizes where the bit map has to be enlarged. They become very jagged just like those double height routines on the Beeb.

The alternative to this is an outline font definition. Each character is defined mathematically as an outline, a combination of straight lines, circular arcs or bezier curves, the line describing how the letter should be drawn. So an 'O' would be seen as a circle with a hole cut out. This means the character can be drawn smoothly on screen at any size.

Of course the outline itself isn't drawn. The screen can only show patterns of bits or pixels. The outline is first converted into a bit map then displayed. Because it is created anew each time, a smooth bit map for any size can be created.

This is only practical on very powerful micros though, due to the complex calculations necessary to turn the outline into a bit map each time. To speed things up you can use a cache – that is store the bit maps as they are worked out.

The Arc's new font manager (available with the DTP packages and to be released on a planned Risc OS upgrade disc) is an outline font system. But it uses another few tricks to make text even more readable, particularly in smaller sizes.

First, there is 'anti-aliasing'. As the outline gets turned into a bit map, there are pixels wholly inside the outline (which become black) and others wholly outside, which are white. Further pixels are bisected by the outline of the character and improves the look of small text.

Anti-aliasing isn't worth the effort for larger sized text, so the font manager allows control over the maximum text size that uses it (*Configure Fontmax 3).

In addition, there is a system of 'hinting' – hints on how to scale the outline to different sizes, to preserve the look of the letters. Hints like 'make sure this bit and that bit remain the same thickness' or 'make sure this thin bit doesn't disappear altogether as the character gets smaller'. This is the same as fine-tuning each of the character bit maps.

There are two optional frills. Each character's outline notionally starts exactly at the corner of a pixel. Sub-pixel anti-aliasing produces four bit maps for each character, starting at the corner, half way up, half way across and in the middle of a pixel. This effectively doubles the resolution of the screen for text, but it takes four times as long to compute the bit maps and four times as much cache memory to store them, so it's rarely used except for the smallest lettering.

How does the Arc line up against the other business micros? The machine most strongly identified with desktop publishing, Apple's Macintosh, uses scaled bit map fonts on screen and sends these same bit maps to dot-matrix printers. A system of outline fonts is promised for System

This Garamond T has been designed using the outline technique

7.0, the new operating system intended for sometime in 1990.

The IBM PC and its clones also currently use only bit mapped fonts. Operating system author Microsoft is still undecided about how to incorporate outlines in OS/2 version 2 – itself still at the rumour stage.

The only widely-used comparable system is Postscript, the laser printer package developed by Adobe. This has outline fonts, and a system of hints for scaling. But of course, as the printer can print only black or white, there's no anti-aliasing.

The involvement of Adobe gives a clue to the drive behind outline fonts. If you use bit maps on screen and Postscript on the printer, what you see is never quite what you get on the paper.

Even with a Mac, you have to buy one font for the printer and a screen font. So while the letters are the same height and width, there may be subtle differences in shape. One of the aims therefore is to use a single font definition for both the printer and the screen. This is just what Apple intends to do with the System 7.0 'Royal' outline font format – send the royal fonts to the printer too.

This is just what the Risc OS printer drivers do already. The same font outline is used to create the screen bit map and the graphics data to send to the printer. The font manager can create bit maps in any resolution so it can cope with the different resolutions of each screen mode.

The printer driver just requests a bit map of the correct resolution for the printer and the font manager creates it in exactly the same way from the same font outline. This bit map is then sent to the printer as graphics data in the same way as a screen dump. So, aside from the different resolutions of the screen and printer, what you see is truly what you get.

The only problem is speed. To print a whole page of graphics, a megabyte of graphics data has to be sent down the printer cable. This can take around five minutes per page, plus the time taken to compute the bit maps.

The Postscript printer driver avoids all this, as the fonts are held in the printer itself. Much less data has to be transferred for each page, so printing is quicker.

There is a big problem of font compatibility looming. Postscript uses two types of outline font. Type 1 is fully hinted but Adobe encrypts all its fonts to prevent people designing their own. Type 3 fonts are simple to create but don't benefit from

20pt bit mapped characters on the Macintosh screen at 20pt

10pt Mac characters scaled to 18pt

Archimedes screen characters enlarged from BAU ordinary size text size to illustrate anti-aliasing.

Four bit maps produced by sub pixel anti-aliasing

MY TYPE

If you've ever needed a character reference–then read on. We've got the low-down on the battle of the fonts

Graham Bell

the hinting and look the worse for it.

Apple's forthcoming Royal format is more comprehensively hinted and uses relatively simple quadratic curves to draw the outline, whereas Postscript (and Acorn) uses bezier curves. So Royal is incompatible with Postscript. So is F3, the format developed by Sun and Folio or outline fonts on Unix workstations. And so too is Compugraphic's *Intellifont* system. And *Typographica*.

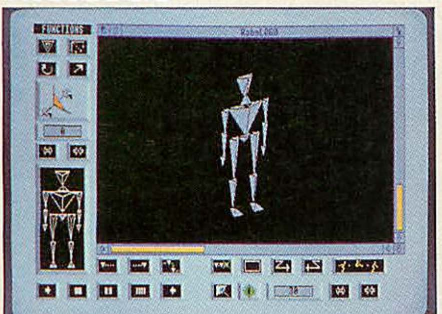
Given the effort involved in defining a full font, particularly in inserting the hints, typeface designers like Linotype, Monotype and Compugraphic won't be falling over themselves to support all-comers. The established nature of Postscript, the DTP power of Apple and the steamroller effect of whatever Microsoft chooses for OS/2 are likely to win out in the wider market, so the other systems will have fewer fonts available.

The full range of fonts for the Acorn system is limited so far to 14. Acorn's typeface designer, Cambridge-based DTS, is currently working to duplicate the set of 35 fonts supplied as standard with the Apple Laserwriter and other Postscript printers. And Acorn will make the font editor available so anyone with enough time and skill can design their own fully-hinted, scalable, outline font.

SILICON VISION

SOFTWARE FOR THE ARCHIMEDES COMPUTER SYSTEM

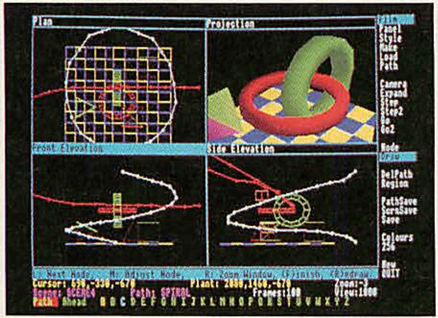
RoboLOGO



This revolutionary new extension to traditional LOGO, made possible only by the enormous computational power of the Archimedes, provides three dimensional control of an articulated humanoid or animal figure through the use of a standard LOGO language. Sophisticated natural commands such as 'Walking', 'Turning', 'Bowing', and 'Picking', etc are automatically represented graphically by natural movements of the 3D figure. This natural form of graphical response is readily understood by students using LOGO to learn the concepts of logic & reasoning. The traditional Turtlegraphics & 3D Glider features are also supported for easy transition to this innovative concept in natural response LOGO.

£69.95 (ARC) New

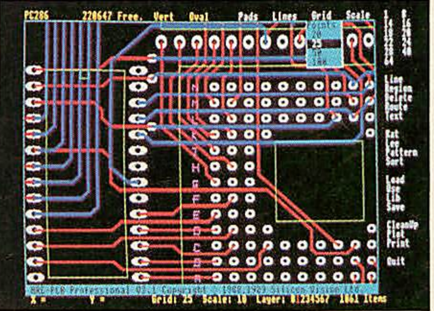
FILM-Maker



The package provides an interactive environment to create animated sequences of 3D scenes with dynamic camera motion for 'walk-throughs' and 'flight-paths' for objects within the scene. The fully graphical environment requires no programming or textual entry and the capability to calculate smooth shaded frames of complex scenes with lighting effects at rates of 60/minute allows fast interactive design of animated sequences. A large number of these frames can then be stored using built-in compression facilities to play-back at video scan rates for on-screen animation or video recording. Fully compatible with SolidCAD and SolidsRENDER, animation Oscars are now within your reach.

£79.95 (ARC) New

ARC-PCB Professional



The ultimate PCB design package developed specifically for the Archimedes is now even better. ARC-PCB Professional follows on the success of the original and provides Faster & Improved Automatic Routing, Oval & Circular pads with fully variable sizes, Faster Redraw, Extended library part manipulation, & Instant Editing operations for substantially increased productivity. This Professional version operates orders of magnitude faster than the original and surpasses all other PC-based PCB design systems in features & speed of operation for the fastest turnaround from concept to finished board design. Take the lead for your PCB designs before your competitors do.

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Realtime Solids Modeller

The package includes both the sophisticated design environment of SolidCAD and the high speed capability of a Realtime Graphics Language module to provide the fastest programmable animation facilities bringing any design to life from within your own programs. Facilities include 3D Rotate, Scale, Orbit, Perspective, Position & extensive display styles for wireframes, hidden-surface removal, smooth shading and multiple light sources with individual intensities.

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The next generation CAD package combining 2D Draughting and 3D Modelling techniques with advanced smooth shading and lighting effects to provide the ultimate 3D Draughting System for Architectural design, Interior design, Engineering design and Teaching CDT. Allows drawing in plan, front & side elevations and also directly in 3D to visualise a model while it is being created. Powerful zoom, pan, sweep, extrude and macro facilities are also provided to enhance design productivity.

£49.95 (ARC) New

SolidsRENDER

The fastest most advanced Ray Tracing package for the Archimedes producing photo-realistic images of SolidCAD designs or FILM-Maker animations which take into account light sources, reflections, shadows, transparencies, refractions and textures for the highest quality pictures from the leading 3D graphics experts renowned for technical excellence.

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Gate Array Design System

An introductory course for teaching Silicon Chip Design with facilities for Array design, Cell design, On-line Help and a tutorial on integrated circuit design. Ideal as a low cost teaching tool where expensive silicon fabrication facilities are not required.

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£275.00 (ARC) New

RiscBASIC

The best BASIC V compiler money can buy. Here's what the reviewers say:
"If you are looking for THE compiler to go for, and are confused about which one deserves to win the very public battle that has been raging in the advertisements, well my preference is for RiscBASIC" - RISC USER Aug 1989.
"In summary, BASIC V is the best version of BASIC produced and RiscBASIC provides the most compatible, fastest compiler for this language. My congratulations to Silicon Vision" - Archive June 1989.
"very useful indeed for development work...produced significantly more efficient code" - Micro User July 1989.

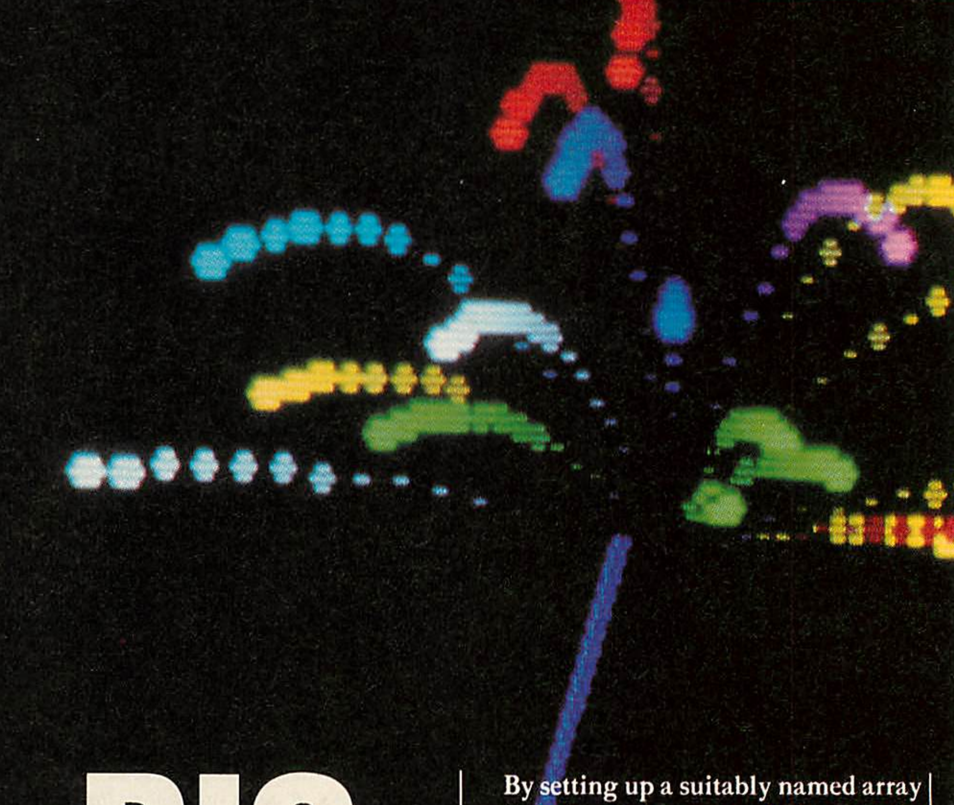
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BIG BANG

Launch into winter with these cracking programs for your micro

Norman Cadel

Imagine if you will, a starlit November night. The sky flickers with fire and the smell of delicious hot dogs and other winter goodies drifts up your nostrils on the evening breeze. Now then, don your scarf and wellies and prepare yourself for the *BBC Acorn User* Firework Extravaganza.

The programs

The programs on the yellow pages consist of two for the Archimedes, one for the BBC and one that will work on both machines.

Obviously the Arc programs are faster and more colourful, although the Beeb still looks impressive against its bigger brother.

Whereas the Arc can calculate and plot hundreds of individual points per second, the Beeb has to use other methods to work at a realistic speed.

To enjoy the show, just type in the listings, light the blue touch paper and stand well back . . .

Roman candles

Given the limitations of the Beeb, it is surprising what can be produced using a few tricks. True animation is achieved by displaying single static frames one after another. This method can be employed by using a separate colour for each frame. By making only one visible (not black) at a time, an illusion of movement can be achieved.

There are 16 colours available in mode 2, only 15 of which can be used. It is always necessary to 'reserve' one colour (in this case black) for use as a background. If you were to use all the colours, the background would flash as well.

The theory can be explained like this. Imagine a line of 15 dots, side-to-side on screen. Now change them all to black using VDU 19. Finally, go through the line changing each point to white (or any colour other than black) and then back to black. If you repeat this last step you will see a single dot moving across the screen.

The order in which the dots are coloured must be the same as the order in which they are changed.

More colours can be used for the animation by limiting the number of frames. In the Roman candle program on the yellow pages, three colours are used, allowing 15/3 = 5 frames of animation per colour. The loop from 60 to 110 is responsible for setting up the three sets of frames.

Rockets

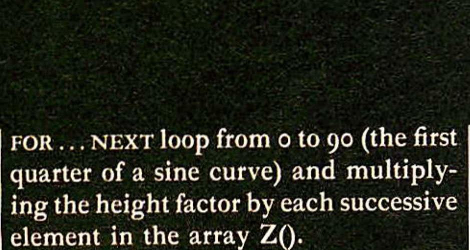
Although the Beeb is a good number cruncher, there are operations such as SIN, COS and TAN that can considerably slow it down.

In order to speed up a program which uses trigonometry, it is often necessary to work out all the possible solutions beforehand. This may sound unecessary, but can make a program run as much as three to five times faster still after the initial delay.

By setting up a suitably named array – sin(90) – at the start, solutions can be virtually instantaneous.

Three arrays are set up. X(sides) and Y(sides) to hold the base co-ordinates for the explosion circles, and Z(90) to hold the path x co-ordinates for the rocket trails.

When a rocket is launched, all that is required is a height and direction for the trail. The path that the trail takes can then be calculated by running a



FOR ... NEXT loop from 0 to 90 (the first quarter of a sine curve) and multiplying the height factor by each successive element in the array Z().

The same rocket trail (using the same height and direction) is then plotted in black to remove the former.

The final point of the rocket trail is used as the centre for the explosion. The explosion itself is achieved by plotting successive circles of points around this centre. An illusion of fading sparks is achieved by changing the colour according to the diameter of the circle. Fortunately the colours appear in correct order (white, yellow and red) in the Beeb's palette although another 'look-up array' could have been used if this wasn't so.

The Arc programs

Unlike the Beeb programs, the Arc counterparts can utilise the machine's extra speed and calculate co-ordinates as the programs are running.

However, the rocket program does use a table for determining the brightness of colour for a particular point.

Simplified, the rocket programs work like this. An array is set up depending on the value of dots (the maximum number of dots allowed on screen.) This array is used to store the positions of each point and other values associated with each point – increments, colour and so on.

A number of rockets (maxact) are then initialised. Each rocket travels up the screen with its y increment changing depending on the current x increment to achieve the parabolic motion. When the rocket has reached its maximum height (when the y increment has reached 0) it explodes, and a new rocket is initialised.

The explosion is made up of a number of independently moving points, each of which is coloured depending on the colour table (coltab). This contains the GCOL value for each of the main colours used. Explosions end when each point colour has reached 0 (ie. black).

A colourful explosion of rockets are repeated until the ESCAPE key is pressed.

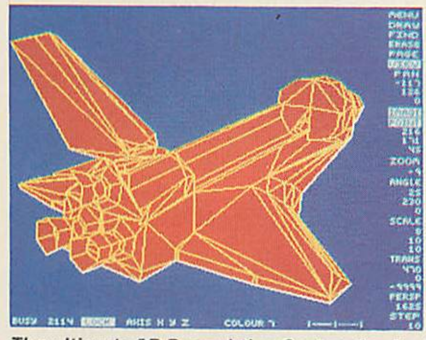
The Catherine wheel program works in a similar manner with each spark separately controlled under gravity.

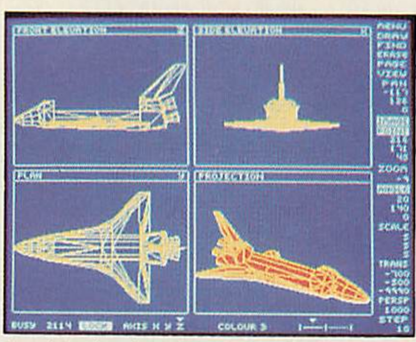
All that remains now is to put on your anorak and get cracking!

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SOFTWARE FOR THE ARCHIMEDES & BBC

SolidCAD





The ultimate 3D Draughting System for Architectural design, Interior design, Engineering Design and Teaching CDT. Allows drawing in plan, front & side elevations and also directly in 3D view. Includes powerful zoom & pan options for precision draughting and surface definition for creating solid colour objects. Also includes Sweep, Extrude & Macro facilities for designing very complex objects easily. Designs created with SolidCAD are compatible with the Realtime Graphics Language for high-speed flicker-free animation. The custom Archimedes version also performs smooth shading for realism. SolidCAD(Arc) users can upgrade to the Realtime Solids Modeller (Arc) for £40.00.

£49.95 (ARC or BBC B/B+/Master), New

REALTIME SOLIDS MODELLER

The package includes both the sophisticated design environment of SolidCAD and the high speed animation capability of a Realtime Graphics Language (RGL) module developed in pure ARM Risc code for supercharged performance. The package is ideal for Architectural design, Interior design, Engineering design & teaching CDT. The RGL module can be used to create standalone flicker-free animation of designs from your own programs. Smooth shading is also performed for realistic images. Through our in-house expertise in 3D Design and High-speed techniques, no other package can rival the design environment & animation speed of the Realtime Solids Modeller.

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REALTIME GRAPHICS LANGUAGE

The Realtime Graphics Language rom provides a complete 3D Solids/Wireframe animation system with 52 star commands and 3D Editors for designing objects to animate from your own programs. Includes a 35,000 pixels / sec line generator for fast 3D drawing rates, 3D Rotate, Scale, Orbit, Perspective and Turtlegraphics. Also compatible with designs created with SolidCAD (BBC).

£49.95 (BBC B/B+/Master)

SUPER-DUMP

The ultimate printer driver which takes advantage of the highest resolution capability of ordinary Epson compatible printers to provide 1920×1024 resolution. Images can also be scaled, positioned and previewed before printing. Fully compatible with SolidCAD, Realtime Graphics Language, Gate-Array design system & 3D CAD/Animation system. Your own graphics programs or other CAD packages can be made compatible with Super-Dump by the addition of a few simple commands. An example program is included in the package.

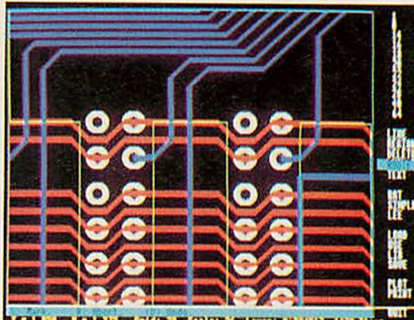
£15.95 (BBC B/B+/Master), £24.95 (ARC) New

Presentation System

The package provides an interactive environment to create, edit and play-back computer controlled presentations for lectures and demonstrations. Also handles graph plotting for polynomials & user-defined functions which can be incorporated within the presentations.

£34.95 (BBC B/B+/Master), £49.95 (ARC) New

ARC-PCB



The ultimate PCB design system developed specifically for the Archimedes with a specification that cannot be matched. Includes Automatic routing, Rats-nesting, 8 layers, Surface mount capability, 0.001″ resolution, 32″×32″ maximum board size, On-line Help, Fast Zoom/Pan/Redraw, Text & Silkscreen facility, Variable Line/Pad/Text/Grid sizes, Part Libraries, Block Move/Copy/Rotate/Mirror/Erase options, and up to 300,000 components.

For hardcopy, the system supports the industry standard HP-GL, GRAPHTEC, PLOTMATE plotters and printers at their highest resolutions. Also provides automatic drilling information with extensive support from PCB manufacturers for final layout and production, optional 1 year telephone Hotline support (£100) and software maintenance service (£75) is also available.

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Risc BASIC

The first true BASIC V syntax compiler which will convert your programs into supercharged Risc code for turbo performance leaving the competition standing. Features include Relocatable modules, full cross references, Double precision floating point & Integer support, in-line assembly, Window-based or command line compilation environment, standalone code generator, object code optimiser, full array manipulation and dimensions support, multiple exit structures & full runtime error handler.

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A new 32-bit implementation of the FORTH-83 standard, designed to take full advantage of the ARM architecture. Features include Multi-tasking, Optimising compiler, built-in ARM assembler with floating point mnemonics, built-in Full screen Editor, File system interface, OS calls support, Floating point & Integer maths, WIMP support, Single-step debugger, Shadow screen for documentation, Block manipulation, Dictionary & Vocabulary display, Call finding and a standalone code generator.

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PUT UP JOB

This will make everyone sit up and take notice. Use our poster program to let them all know what's happening

Richard Abbotts

The BBC micro and Master have, at best, a resolution of 640 dots across the screen. Epson-compatible printers have a horizontal resolution of 240 dots per inch, or 1920 dots across the page. This program enables you to take advantage of the printer's quadruple density mode to produce handbills, cover pages, tickets and posters up to A4 size.

In addition, it will handle boxes and shading, fonts of various sizes with proportional spacing, decorative borders and the facility to load and save complete and unfinished posters.

Clearly the BBC micro cannot preview what will be seen in print. To get the maximum printed resolution would take three horizontal scrolling screens in mode 0. Even with a more modest vertical resolution of 1024 dots it would require a total of 12 mode 0 screens!

Instead the program shows the texts and borders as plain rectangles on a mode 4 screen. In practice this is quite adequate for planning the layout.

The poster itself is stored as a number of text strings, T$(), with associated variables such as the name of the font to use, F$(), the height, H%() and width, W%() of the lettering, and the type of box, BT% which surrounds it.

Six types of box around sections of text are provided:

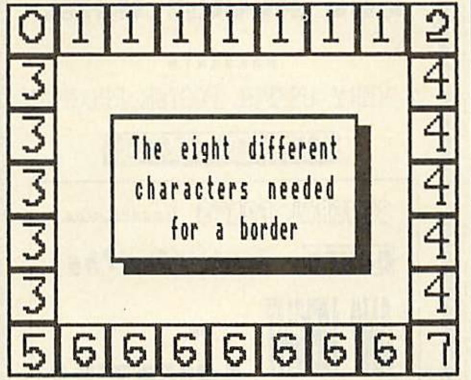
- 0 no box
- 1 shaded rectangle
- 2 shaded rectangle
- 3 shaded rectangle
- 4 outline rectangle
- 5 underline only
- 6 drop shadow box

A box may also be used to surround several texts provided it has no text itself.

One advantage of storing the posters in this way is that they actually take up very little space on a disc – a few hundred bytes for each poster.

BOX TYPE 0 BOX TYPE 1
BOX TYPE 2 BOX TYPE 3 BOX TYPE 4
BOX TYPE 5 BOX TYPE 6

The program offers six box types



There's an attractive borderline facility

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789.<>+;*:@=-↑[]£_/?

The 'heavy' font – on the monthly disc

Running the program

Before the Poster program can be used, you will need at least one font file.

Much of the attractiveness of a poster depends on the lettering. The fonts for this program are based on a 16x16 grid. A suitable font designer, CHARDES is provided and if you have a copy of *Stop Press*, you already have a variety of 16x16 fonts which can be converted to work with the poster program with FCONAMX.

This program prompts for the name of the AMX font. Reply with, say, BUBBLES, not F.BUBBLES – the directory is assumed. The new font will be saved as G.BUBBLES.

Designing fonts from scratch can be a tedious business so to help get you started, there's another program, BEEBLET, which will generate four font files based on the Beeb's own character set. FCONAMX is in fact formed from BEEBLET by making changes in the program, MODS, in the yellow pages.

Poster also uses a machine code routine (MC) assembled from the Basic program, ASSEM. So, to start with, you will have a disc with the following:

MC	POSTER
G.BBCFAT	G.BBCFONT
G.BBCLEAN	G.BBCTHIN

along with other font files if you have used the AMX option.

Run POSTER and the screen will show a poster area on the left and a menu on the right to begin a new poster or load an existing one.

When you begin a new poster you should move the cursor to position the first text 'box'. You can move it later but you have to start somewhere.

To speed the cursor keys, use them in conjunction with the SHIFT key. Press RETURN to fix the box and you will be prompted to key in text.

If you don't want any letters, just a box, then enter RETURN immediately and you can then move the cursor to the top right of the box. Its width is adjustable later but not its height.

If you entered text you will be prompted for a font name, since the program needs to access the space table to calculate the width of the box. Reply with the bare name, without a directory prefix. The program assumes that all font files are stored in directory G.

Having started or loaded a poster the menu enlarges. The cursor keys will move boxes around the screen.

SPACE enables the cursor to flit from box to box (when you have more than one) and tells you what each box contains. The commands provided are:

- F change the font
- H change the letter height
- W change the letter width

X extend the width of a box and increase the text microspacing
N narrow a box. Microspaces are removed from text until there is just one between letters
O change the box type
T change or add text
Z change the size of the poster
R remove a box
S saves the poster into directory P
E change the border pattern to use a *command (catalogue, etc)
P print out the poster

ESCAPE and errors are intercepted and enable you at least to save the poster data, option S.

Note that the program assumes the printer is set up for automatic line feeds after each carriage return. If it is not, you will find the entire poster printed on one line. Check in your printer manual which Dip switches need to be set to give automatic line-feeds.

If the default directories are inconvenient you can change them. They are defined at line 150 in the POSTER program. Alternatively, you could define all the defaults as " " and use the star command facility to move around the directory structure.

Fontastic

You can create your own alphabets, or modify any of the fonts already prepared, by using the program CHARDES.

The bottom left of the screen shows a 16x16 grid. The top left shows a copy of the actual contents of part of the font area of memory.

D gives access to stored font files – just use the full name complete with directory prefix (G).

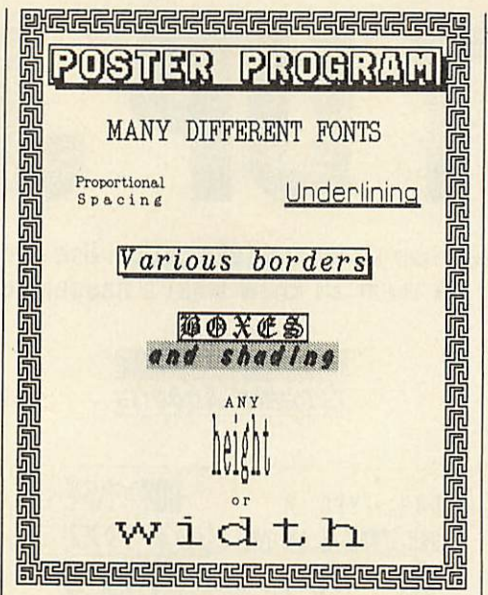
At the top left of the screen the contents of the font area of memory are displayed (sideways – because that is much quicker to display).

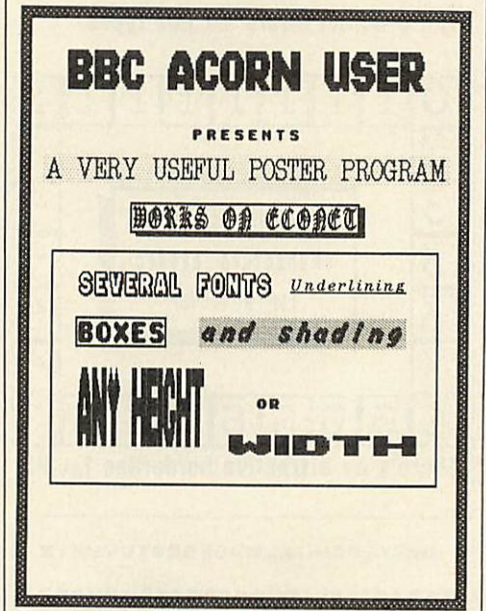
The grid itself operates as a sketch pad. When you are happy with a design on the grid you can transfer it to memory by use of the S command.

To copy the stored contents into the grid use L (load). To clear the font area of memory, use C.

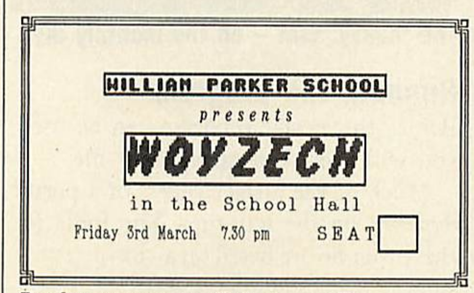
The character you start with is 65 (the letter A) but you can move to other characters by using the Z and X keys.

Sketching in the grid is carried out with a pen-up/pen-down method. The cursor represents either a pen or an eraser. P toggles the pen position between up and down. Pressing I switches to ink and





You can modify any of the fonts already prepared yourself – as shown above



Design your own tickets easily

O switches to wipe. The entire grid may be erased simply by using U. Similarly, the grid can easily be filled with F. For characters with symmetry, the / key makes the right half of the grid a mirror image of the left half.

Finally, to save a font file, use the D option. Press W to select 'write to disc' and give the full name of the font (for example G.MYFONT).

The font files are stored in a convenient way for printing on the printer. That is, the data stored represents vertical bit patterns. (Font files for the screen are usually designed to have horizontal bit patterns because of the way the screen memory is organised).

The data for the top and bottom halves of each character are stored in different parts of the font file. Only the characters 32 (space) to 123 are stored. The data for the top half of the letter A is stored in 16 successive locations in the file starting at 128+16*(65-32). The data for the bottom half of the letter A is stored in 16 successive locations starting at 1600+16*(65-32).

Each font file is &C00 bytes long. The first 680 bytes are a space table. The character A has its space-table entry at position 65, its Ascii code. The structure of the font files is as follows:

0-&1F	description of font
&20-&7C	space table for characters 32-123
&80-&8F	16 bytes: top of character 32
&90-&63F	top halves of characters 33-123
&640-&64F	16 bytes: bottom of character 32
&650-&BFF	bottom halves of characters 33-123

The characters are usually left-justified in their 16x16 grids and the space table entry for a character is the width of the character plus one, to a maximum of 16. That data is used to achieve proportional spacing – prettier and easier to read.

Only the vertical columns which contain set bits are printed. A minimum of one empty column is usually added at the end of each character to separate it from the next character to be printed.

Borderline

One of the most attractive features of the package is the decorative border facility. The program BORGEN will produce three border files, each of which can be used thin or thick.

The program for editing and designing borders is BORDES, which shows all eight characters used at the same time. The program is similar in use to the character designer. It uses the same keys for editing the individual characters.

In addition, W unpacks all eight characters from memory, S stores them all in memory and V loads each character from memory onto the grid.

Having defined characters 0 and 1 the rest of the border can be completed, if you so wish, by reflection or rotation. Pressing / reflects 0 to 2, 0 to 5, 5 to 7, 1 to 6, 1 to 4, 4 to 3 while $ rotates 0 to 2 to 7 to 5, 1 to 4 to 6 to 3.

Alternatively you can complete borders manually, perhaps having a blank top and bottom, and just have decorative margins down the side.

The border patterns are also based on a 16x16 grid. However, this time they are assumed to be of width 16 so there is no space table. Only eight characters are required for a border.

A border file occupies 256 bytes and is structured as follows:

0-&F	16 bytes for top of character 0
&10-&1F	16 bytes for top of character 1
&20-&2F	top of character 2
&30-&7F	tops of other 5 characters
&80-&8F	bottom of character 0
&90-&FF	bottoms of other 7 characters

The listing BORGEN generates three different border files. B.PLAIN, B.CHECK and B.FRILLS from DATA statements.

The main program

The main program is in two parts – an editor and a printing program. It runs on a BBC model B, B+, Master, or Compact and over a network.

To get more Ram to hold the variables on a model B, the program uses the user-defined character area (page &C00) to hold a space table. On a Master or Compact use:

```
150 DIM sptable 128, arw 10
```

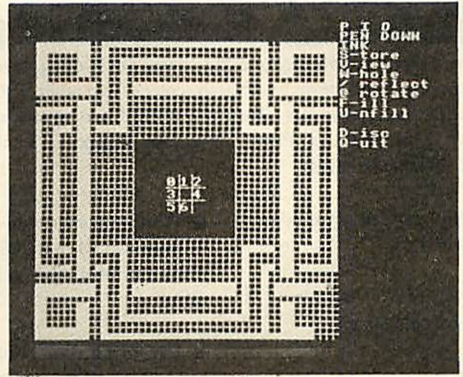
instead.

The printing procedure scans the stored data starting from the top of the poster and looks for any text or box in the next eight Y co-ordinates down.

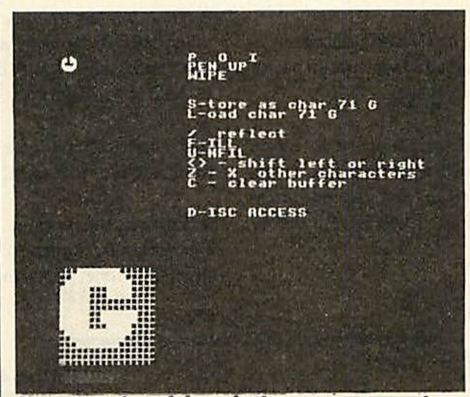
Any text to be included in a particular scan must have its font files loaded first. Taking into account how tall the letters are and how much of the character has already been printed, the appropriate parts of the buffer are filled.

For each unit of width the vertical bytes are repeated. Additional microspaces may have to be inserted between characters if a string has been expanded. These are just zero bytes.

Each piece of text T$() has associated with it the position of its bottom left-hand corner on the screen, stored as screen co-ordinates, X%() & Y%(). In addition it has a box height of BH%() and a width of BW%.



The cursor represents a pen or eraser



You can 'pen' in whatever you want

The letters themselves have a unit height of H%() and a unit width W%(). The box height is calculated by multiplying the unit height by 16.

The box width is calculated by adding the products of the character widths and the unit width, adding on the desired number of microspaces.

The 'box' is an imaginary rectangle, visible on the screen, which completely surrounds the text as it will be printed. A real box can be added.

These unit heights and widths refer to magnification of printed pixels. Each character is defined in a grid of 16x16 pixels. Such a character would, when printed, come out tall and thin.

However, a square character will only come out square if it is 48 pixels wide by 16 pixels high. That corresponds to H%()=1, W%()=3.

It is possible to use any combination of integer heights and widths. The recommended maximum is 20 but values in excess of 50 high and 120 wide (full poster size) can be used – for example, if you wanted to make L-plates!

Suppose the printer scan is taking in Y co-ordinates from 920 to 927 inclusive. A box of text is situated at Y%()=904 and its height, BH%()=48. The unit height of the letters, H%()=3.

Some of the letter A has already been printed (the top half, in fact). The program calculates the bits printed so far =904+48-928=24. Since H%()=3, means that eight vertical pixels from the font pattern for A have been printed already.

The font-top and font-bottom data yield two bytes: &03 (top) and &88 (bottom). These bytes are shifted eight times to account for the part that is already printed.

The next shift gives one bit to put into the printer buffer byte. This is shifted and added twice more because the unit height is three.

The font bytes are then shifted again and the top bit carried into the printer buffer byte. This is shifted and added twice more.

One more bit is needed but it only needs shifting and adding once to complete the eight bits. The buffer byte is now ready for sending to the printer.

Drawing the line

Every box is analysed into a number of horizontal lines or bars. Shaded rectangles are treated as a single horizontal bar. Vertical lines are treated as a short, thick horizontal bar.

Box type 6, the drop-shadow box, is converted into four lines making a rectangle and two additional thick lines.

All lines use the solid shading pattern. Other rectangles use the shading pattern 1,2 or 3 which matches the box type.

These shading patterns are held in DATA statements. Each is a 16 byte pattern. If you want to alter these patterns, you should remember the horizontal spacing is about a third of the vertical spacing.

For example, to generate a brick wall pattern the data statement would be:

```
DATA &1111111F, &11111111, &111111F1, &11111111
```

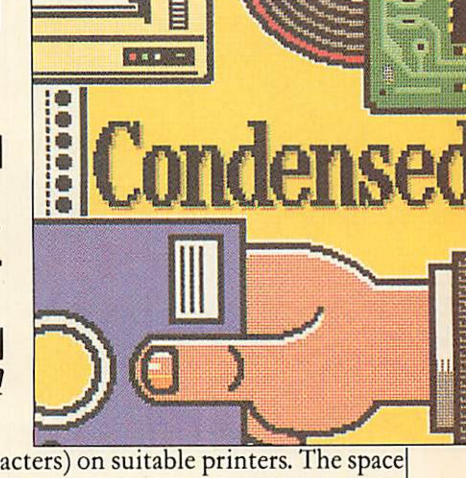
If a bar is encountered in a scan the bottom of the bar is checked to see if it intercepts the scan. The top of the bar is checked in a similar way.

A binary mask is formed which is then AND-ed with each byte of the shading pattern to fill successive locations in the buffer of graphics data to be sent to the printer. So, now you've got the know how – you've just got to decide what you want to put on your poster.

DRIVE

Just what you've always wanted – the ultimate View printer driver

Colin Ferrington



There have been several programs written to provide better printer control for Acorn's *View* BBC wordprocessor, some of which have appeared in *Acorn User* (March 1984 and June 1985).

More recently, Rom-based printer drivers such as *Hyperdriver* have been giving the user more flexibility but somewhat at the expense of usability.

The justification for the expenditure of all this time and energy on writing printer driver programs, is that *View* really does need improving as far as printer control is concerned. Standard *View* allows only two printer highlight characters in the text at any one time. This is extremely limiting for modern printers.

While it is possible to use *View*'s own extended highlights to gain access to more printer commands, this method is rather user unfriendly.

'Second source' printer drivers usually overcome the problem of too few printer highlights by using *View*'s own highlight characters along with one or more extra characters to specify a wider range of printer effects. The problem is the extra characters make formatting of the text impossible. *View* ignores its own highlight characters when formatting but not the extra ones. So you end up having to sacrifice some vital functions to improve printer control.

This is where this *CMF* (*Characters Must Format*) system steps in. Complete control of your printer is now possible, the text remains under control of the wordprocessor, and all is achieved without treading on Acorn's toes.

The answer

The *CMF* system is not only a printer driver but also a keyboard 'preprocessor', bringing to *View* wide ranging and flexible facilities. Once you have used them, you will wonder how you ever managed without them. How does it achieve this?

Fifteen extra highlights have been implemented, each having a separate printer effect. Where possible, the characters denoting the highlights on screen are mnemonic for the effect in question.

The standard highlights, SHIFT-f4 and SHIFT-f5 function as normal except that SHIFT-f4 is also used to enable new highlights to be inserted into the text. First press SHIFT-f4 then (immediately after) press CTRL-SHIFT and any one of the function keys, cursor keys or the copy key to insert the required highlight – see the list below. The new highlight character displayed is a replacement for the original *View* highlight character, not an addition to it.

CTRL-SHIFT-f0	superscript
CTRL-SHIFT-f1	subscript
CTRL-SHIFT-f2	proportional spacing
CTRL-SHIFT-f3	NLQ
CTRL-SHIFT-f4	Italic
CTRL-SHIFT-f5	Double height
CTRL-SHIFT-f6	Double width
CTRL-SHIFT-f7	Emphasised
CTRL-SHIFT-f8	Star command
CTRL-SHIFT-f9	Alternate character
CTRL-SHIFT-COPY	Pad character
CTRL-SHIFT-LEFT	Backspace
CTRL-SHIFT-RIGHT	Control sequence
CTRL-SHIFT-UP	Half-line up
CTRL-SHIFT-DOWN	Half-line down

The highlights on keys f0–f7 are 'classical' toggled printer controls to initiate a printer control sequence via the printer driver. Those on f8 and the right cursor operate by enclosing some text which makes up a star command or printer control sequence.

The highlight on f9 operates by adding 128 (setting bit 7) to the Ascii value of the characters following it, so allowing printing of the extended character set (IBM characters) on suitable printers. The space character has been excluded from this facility so that spaces can be printed more easily along with the extended characters.

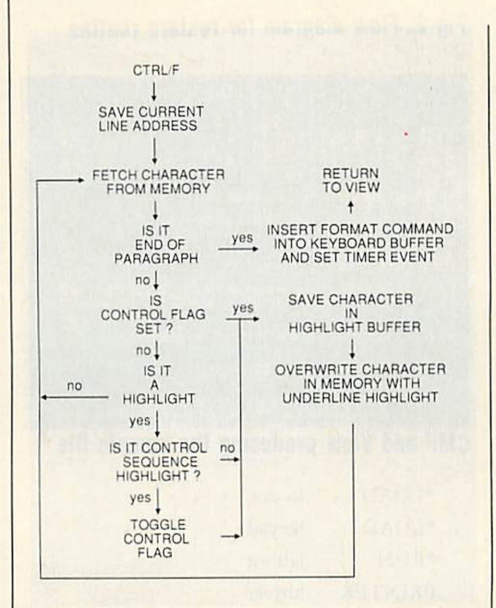


Fig 1. Flow diagram for formatting routine

The up, down and left cursor highlights also send printer control sequences via the printer driver but these are not toggled since they may be required to be repeated and toggling would preclude this. This group is particularly useful for composing layout of formulae and tables for reports.

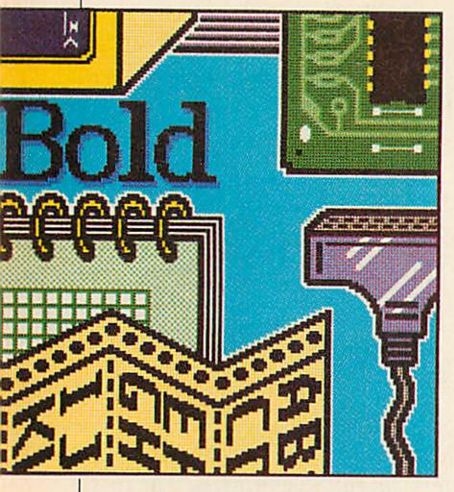
Finally the COPY key highlight provides a pad character which is used to 'glue together' any words the formatting process must not split. The pad character is printed as a space in the final document.

Formatting of text which includes any of the new highlights is achieved by pressing CTRL-F. The standard *View* format key f0 can still be used for text which does not include them but CTRL-F will also cope with this. Printer control code sequences to produce effects not available with the built-in highlights can be sent anywhere in the document. Sequences are started and ended with the CTRL-SHIFT-RIGHT highlight. They are treated in a very similar way to the embedded printer commands in *Wordwise Plus* and do not interfere with formatting. Star commands must be confined to their own line since no allowance is made for them in the new formatting process. There is no real advantage in being able to embed them anyway. The line on which they appear will be printed as a blank in the final copy.

How it happens

That in a nutshell is what the *CMF* system can provide. How is it all achieved? *View* allows one page (&400) for printer drivers – not much room for a driver with ambition! However it is possible for the code at &400 to access locations in other pages so part of this driver sits in page &400 while the printer

ILLUSTRATIONS BY JONATHAN INGLIS



control sequences and some program flags sit in page &C00. It's like being in the driver's seat, the back seat and the !BOOT all at the same time.

So the driver knows where to go and what to do. There is a co-driver, the 'keyboard interrupt processor' which sits at &900, and is concerned with monitoring the keyboard for special effect keys and performing the previously impossible task of inserting Ascii codes greater than &81 into the text.

It is these Ascii codes which give the driver its 'sense of direction'. Luckily, although *View* does not normally allow codes above &81 into the text, once there they are treated as any other character when it comes to moving text around, writing text to disc and so on.

The driver and keyboard routines need a little more help before they can perform their functions properly. The 'highlight character loader' sets up the user defined characters to give the 15 extra highlight screen characters, which indicate on screen the effect which will result at the printer. The 'printer effect codes' have to be loaded into the second half of page &C00 ready for use by the driver, and last but by no means least, the initialisation program checks on the version of *View* which is installed in the computer (v3.0 for preference), loads various locations with values, redirects the event vector and finally enables the keyboard and ESCAPE events to start the system up.

The basic programs B.HCHARS, B.KEYBD and B.DRIVER create the machine code routines !hchars, !keybd, !kbinit, and !driver and the datafile !codes which are saved to disc ready to be *LOADed or *RUN from a !BOOT file.

A typical !BOOT file would be:

```
*WORD
NEW
*RUN       !hchars
```

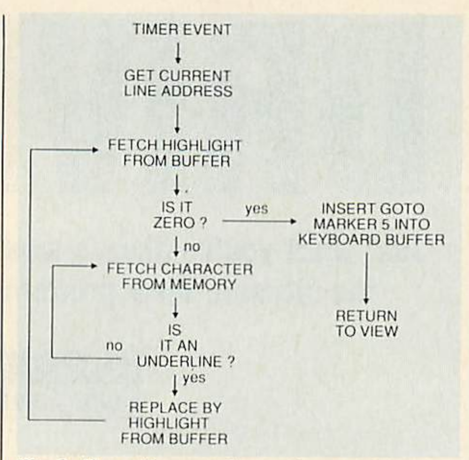


Fig 2. Flow diagram for restore routine



CMF and View producing the sample file

```
*LOAD      !codes
*LOAD      !keybd
*RUN       !kbinit
PRINTER    !driver
LOAD       layout
```

The order of commands in the !BOOT file is important since memory locations are overlayed or altered at various points in the initialisation process.

Working it all out

The heart of the *CMF* system is the keyboard 'preprocessor'. This program enables the insertion of new highlights into the text and when required causes *View* to format the text, making allowance for the new codes.

Also included with this routine, though not strictly part of it, is the control code sequence interpreter for the printer driver.

Insertion of the new highlights into the text is the first hurdle. This is achieved by monitoring the keyboard for a *View* underline highlight and then if the character typed immediately after is one of the new highlights, overwriting the original underline with it.

If the second character is not a new highlight, the underline highlight is accepted at face value.

Once the highlights are in the text, formatting is achieved by pressing CTRL-F with the cursor at the start of the text to be formatted. The formatting process itself is a bit of a 'con', with *View* eventually doing the hard work. First of all the section of the text about to be formatted is scanned, and any highlights found are stored in a buffer.

These, and any characters making up a control sequence, are substituted by the *View* underline highlight. The instructions to format the paragraph and then to set marker 5 are then put into the keyboard buffer and just before returning control to *View* and allowing formatting to take place, a timer event is initiated.

After *View* has formatted the text, taking proper account of the underline highlights, the timer event calls the restoration routine which replaces the underline highlights with the original ones from the buffer and forces *View* to refresh the screen by issuing a GOTO marker 5 instruction, so making the original highlights reappear. Figures 1 and 2 should help to clarify what is going on. The keyboard 'preprocessor' makes use of several pointers which *View* keeps in zero page. Figure 3 lists these.

The printer driver itself is basically similar to other programs printed in *BBC Acorn User*. There are, however, certain obvious differences.

Initialisation of the driver takes place if, when it is activated, the 'pflag' is not zero. Since this flag is set to &FF each time ESCAPE is pressed, initialisation takes place each time the PRINT command is issued and each time the first page is printed under the SHEETS command.

Initialisation involves setting all the highlight flags to zero so the toggle effect of the highlights always starts by switching the effect on and zeroing the 'pflag' so that reactivation of the driver by subsequent pages under the current SHEETS command will not cause re-initialisation. So long as all highlights are used in pairs, the printer will always be left in a usable state at the end of printing.

If a highlight is forgotten, some effect may be left on for the next print run. The printer can be reset by using a control sequence at the start of the document (27, 64 for an Epson).

However, if the SHEETS command is in use and for some reason the first page is MISSED, the printer reset command will be missed also. To overcome this problem, CTRL-@ has been implemented as an immediate printer driver and printer

VIEW – CMF printer control system

CTRL-SHIFT	SUPER SCRIPT	SUB SCRIPT	PROP. SPACING	NLQ	ITALIC	DOUBLE HEIGHT	DOUBLE WIDTH	DOUBLE STRIKE	STAR COMMAND	FORCE MSB
CTRL	DELETE BLOCK	NEXT MATCH	FORMAT MODE	JUSTIFY MODE	INSERT MODE	DEFAULT RULER	SPLIT LINE	JOIN LINE	NEW RULER	
SHIFT	MOVE BLOCK	SWAP CASE	RELEASE MARGINS	DELETE TO CHAR	UNDER-LINE	BOLD	GOTO MARKER	SET MARKER	EDIT COMMAND	DELETE COMMAND
	FORMAT BLOCK	TOP OF TEXT	BOTTOM OF TEXT	DELETE TO EOL	GOTO SOL	GOTO EOL	INSERT LINE	DELETE LINE	INSERT CHAR	DELETE CHAR

CTRL-SHIFT
COPY Pad character
LEFT Backspace
RIGHT Control sequenc
UP Half-line up
DOWN Half-line down

CTRL-F new format
CTRL-@ printer reset

The function keystrip used with View and CMF

initialisation command. This should only be used in *View*'s command mode!

The other differences in the driver involve its ability to interpret the printer escape sequences and star commands embedded in the document. The escape sequence routine is turned on and off by the CTRL-SHIFT-RIGHT cursor highlight.

When on, the characters forming the sequence are converted into their numeric equivalents and sent directly to the printer. The star command routine, activated by CTRL-SHIFT-f8, copies the characters making up the command into a buffer and then calls the OSCLI routine to perform the command.

Of course, with any second source solution to the problem of the lack of printer control in *View*, there will always be idiosyncrasies but as far as I am aware there are only two real problems with this system. The most significant of these is that the READ command is no longer usable since the highlight codes are stripped from the text as it is read in. This also means that EDIT processing of documents is not possible since, for this, READ is required.

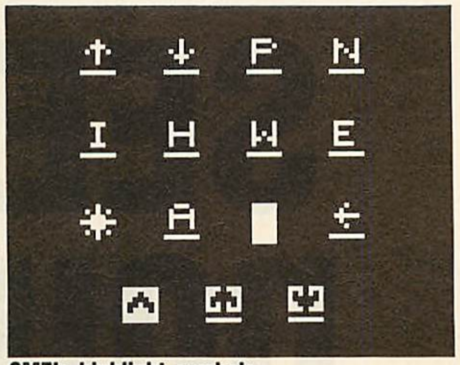
Because of the problem with READ, a new star command, *READ has been implemented which will read a file from disc and insert it before the current line if there is enough spare memory, and keep any highlights intact.

This will not overcome the EDIT problem but since it is common for large documents to be split into several files rather than use EDIT, this may not be too big a drawback. Although it is possible for star commands to be implemented by redirecting the OSCLI vector, lack of space in the computer's memory means that the *READ command must be implemented from sideways Ram or Rom, and is not included with the current suite of programs. The second problem occurs only with version 2.1 of *View* and means a new highlight cannot be used as the first character on a line.

This is because this version of *View* interprets the new highlights as 'command line initiators' when in this position. If it is absolutely necessary for a highlight to be the first character on a line with this version of *View* then this can be achieved by setting a standard *View* line command (such as CE) on the line in question prior to setting the highlight.

pointer	VIEW 2.1	VIEW 3.0
current line start	&09/&0A	&08/&09
line workspace (command)	&05/&06	&00/&01
line workspace (text)	&03/&04	&02/&03
cursor POS in current line	&43	&40

Fig 3. Pointers used in CMF system

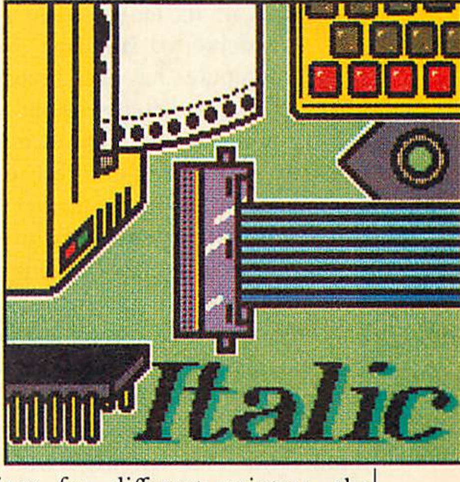


CMF's highlight symbols

Since the system is based on redirection of the event vector, BREAK must not be pressed during use as this will reset the vector to normal and effectively remove the system from operation. This will not affect the text in memory in any way (unless *View* 2.1 is being used, due to its lack of attention to the BREAK key).

To exit cleanly from *View* after using the *CMF* system, another new command, *QUIT, has been added. This command returns to Basic after redirecting the vectors to normal operation, but again this is in sideways Ram.

The printer driver included with the system is Epson compatible. To customise



the driver for different printers, the control code sequences at the foot of the driver program B.DRIVER must be changed. However, if the control sequences are changed to give a different effect at the printer, then to be consistent, the highlight display character data in program B.HCHARS should also be changed to give a mnemonic character for the new effect.

I am currently working on driver generator and editor programs which will make this customising process as painless as possible but the program listings in the yellow pages are, I hope, sufficiently annotated to allow competent users to make their own alterations.

Because of the interlinking of the various parts of the *CMF* system, it is extremely important the listings are typed in accurately and no changes made to the code without careful consideration.

There are four text files on the monthly disc called V.EXAMPL1, V.EXAMPL2, V.KEYSTRP and V.TABLE.

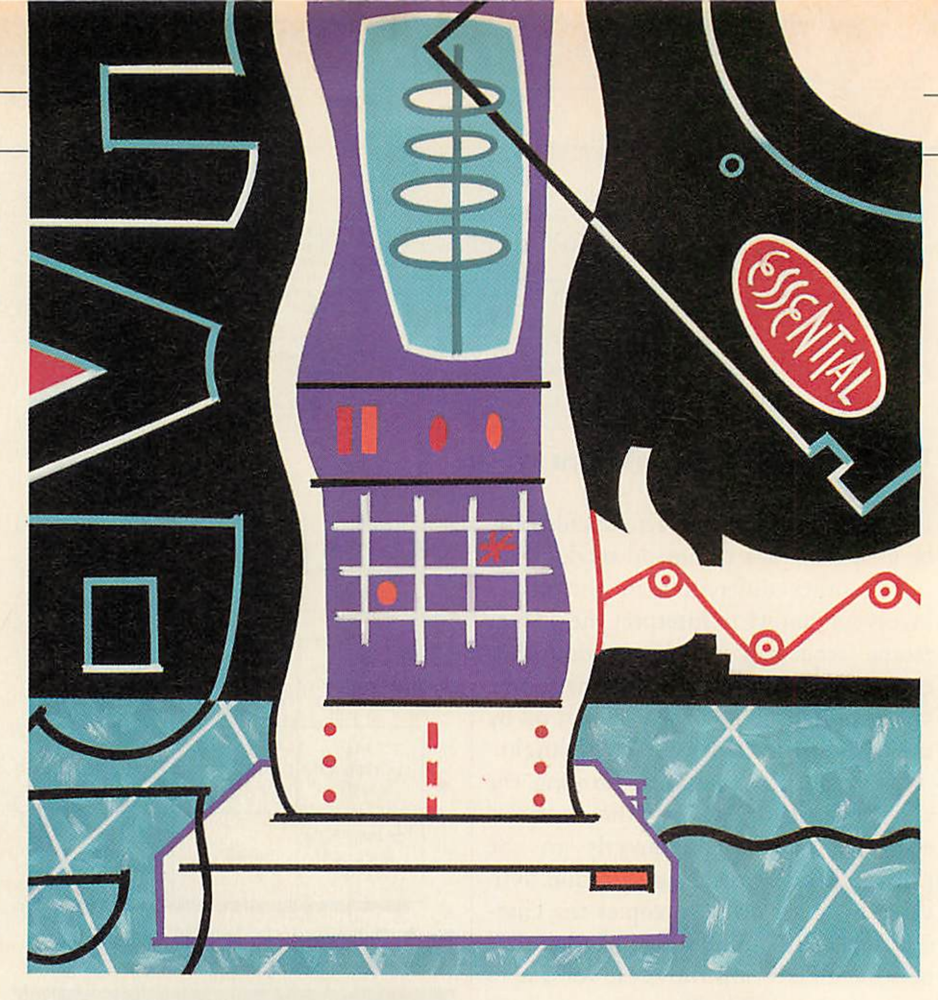
V.EXAMPL1 should print on any Epson compatible printer as it contains a limited range of highlights (though far more than are easily obtained by *View* itself).

V.EXAMPL2 requires a more sophisticated printer. Any 24-pin printer should be able to cope but the commands for double height may be different.

V.KEYSTRP will print on an Epson compatible printer and produces a keystrip listing all the new commands.

V.TABLE is an example of the professional looking copy which can be produced if your printer allows access to the IBM graphic character set.

So to be in complete control of your printer, and your text, all you have to do is type in the programs, run them to generate the code, !BOOT into *View* and then, without wishing to appear rude, get formatted!



SEEING DOUBLE

Our latest wander into the language laboratory leads us to C and BCPL

Neil Sykes

For all its faults, Basic is still a widely-used language. No home computer has ever been successfully marketed without it. Even professional and academic objections to Basic have not threatened its dominance in the home market.

The first language to make any impact in the home market is the language we look at this month – C. Although C has only recently been made available for BBC micros and some versions will not run on the basic model B, a similar language, BCPL, has been available for some time. This language had a great influence on Kernighan and Ritchie, the developers of C and the languages have much in common, so here we will consider them both.

Like Pascal last month, C is a compiled language. The program is written as Ascii text and then compiled into executable code. This may be either 6502 or Arm machine code or an intermediate code requiring an interpreter.

As with the other languages we have looked at, we will start by translating a simple Basic example.

```
10 S$="This is a no. "
20 FOR N%=1 TO 10
30 PRINT S$; N%
40 NEXT N%
```

In C this becomes:-

```
    #include <h.stdio>

main()
{
  int n;
  char *s;

  s = "This is a no. ";
  for(n=1; n<=10; n++)
    printf("%s%d\n", s, n);
}
```

and in BCPL:

```
LET START() BE
$(
   LET S = "This is a no. "

   FOR N = 1 TO 20 DO
     WRITES("%S%N*N", S, N)
$)
```

The very appearance of a C program is a big departure from languages we have seen so far. For the moment, we will leave aside the cryptic #include at the top and concentrate on the body of the program.

In all C programs, execution starts by calling main(), which must always be present. If parameters are included, they enable you to supply information to the program. Suppose you have written a C program to join two files. If you called it join, you could use it by typing:

```
join file1 file2 file3
```

and adapt main() to read the filenames. This is much easier than having to call the program and then be prompted for the names in turn, as Basic would require.

The declaration of the integer, n, is not unlike the Pascal declarations we saw last month but s needs some explanation.

Strings in C are held as a block of characters with the end marked by a zero byte. The string name (s in the example above) is a pointer – it holds the address of the first character. BCPL works in a similar manner but uses the first byte of the string to hold the length.

This is the reason for the declaration char *s. This means 's points at a character'. Although this may seem a complicated way of accessing a string, it has advantages. Strings may be sorted in a list by swapping pointers – much quicker than copying entire strings.

The for loop shown above is different from Basic (or BCPL, which is here like

ILLUSTRATION BY CLIVE GODDYER

Basic). Its format is:

```
for ( statement1; condi
tion; statement2 )
    statement3;
```

and the effect is: 'do statement 1 then, while the condition is true, keep doing statement 3 followed by statement 2. When the condition becomes false, stop'.

Again, the apparent complication makes things easier in many cases. In Basic you are limited to adding and subtracting the number set by STEP and in Pascal even STEP is unavailable. But in C you can multiply, divide or carry out more complicated operations with the index of the loop without having to create another variable.

Notice also the shorthand:

```
n++
```

in the C program as an alternative to

```
n = n+1
```

C is full of such short-cuts. While their excessive use can make your program unreadable, in moderation they actually improve readability by making the purpose of your code stand out from the mechanics of its achievement.

Displaying information is also very different from Basic. If you ever learnt Fortran, you will recognise something of that language's FORMAT statement:

```
printf("%s%d\n", s, n)
```

The first argument to printf is a string, called the format string, which determines how the information will be printed. Following this is a list of other arguments. Every % in the format string denotes a point where values are to be 'filled in' from the following list.

The letter after the % specifies the type of data (%d for a decimal number, %f for floating-point or %s for a string). The final /n stands for a newline character. Other % and / characters are available and printf provides a flexible way of producing output. A similar procedure, WRITEF, is used in BCPL.

Strictly speaking, printf is not part of C at all. The C specification provides only the most basic facilities for input and output and none for string processing.

All these functions are to be found in the system library. This consists of a number of pre-compiled functions. Compiling your program produces a file with calls to these library functions.

Before such a file can be run, your program has to be linked with the library functions using the linker supplied with the compiler. To specify that you need a function from the library and to prevent the compiler thinking the function call is an error, you need a line in your source file of the form:

```
extern int printf();
```

which means 'printf is defined outside this file'. For most programs, a lot of library functions will be needed so all the necessary extern declarations are grouped into a number of header files, the most frequently used ones being in file h.stdio.

The contents of these files can then be read in when compiling the program:

```
#include <h.stdio>
```

at the top of your program, as we did in the first example.

The real advantage of this is that any functions you write can also be pre-compiled to form your own libraries. This makes your programs much tidier by removing the clutter of the nuts-and-bolts procedures common to many of them.

Both C and BCPL provide all the looping and decision-making structures you would expect of a modern computer language, although some of them have slightly odd syntax. The major difference between the two languages is that BCPL allows only one type of variable – the 16-bit (on the BBC micro) word. Strings are allowed because they are sequences of characters (two per word) addressed by a word. No floating-point variables are available and this may deter many potential users.

C, on the other hand, allows a number of variable types. It will also allow you to build structures (like Pascal's record variables) and the newer Ansi versions of C allow user-defined types.

Unlike other languages we have looked at in this series, C and BCPL were designed as working tools, not as teaching aids. This results in the languages being more powerful but also means a little more effort is needed to learn them.

Both repay this effort with a degree of control over the machine little short of writing in assembler. With the increasing support for the language on the BBC and other micros, C has to be at or near the top of the league as an alternative to Basic.

GETTING INTO C AND BCPL

C has now mostly superceded BCPL so if your machine can accommodate it, C is a better bet.

For the BBC micros, three versions of C are available. Acornsoft C for the Beeb costs £67.85. It comes on four sideways Ram images and operates on a model B with 6502 second processor or on a B+ or Master supplied on disc. It implements the earlier, 'Kernighan and Ritchie' version of C with a few additions, but does not allow user-defined data types.

Beebug C comes on two sideways Roms and costs £59. It is also compatible with the Kernighan and Ritchie standard, but will run on a standard BBC model B. A standalone program generator costs £19.

Mijas Small C costs £57.50 and compiles directly to 6502 code. An optimiser package for increasing speed costs £28.75.

A full review of both Beebug and Mijas' versions of C appeared in the September issue of *BAU*.

For the Archimedes, Acorn supplies an Ansi version of C, incorporating many refinements from the original standard, at £114.

A large number of C compilers are available to run under MS-Dos, so those with the PC emulator will have a wider choice. Similar comments apply to the Master 512, although it is essential to check compatibility.

Acornsoft's BCPL is no longer available for the BBC micro but can often be found secondhand. It comes as a 16K Rom and a 5.25in DFS disc only. The package includes an assembler enabling you to link machine-code routines with your BCPL programs. A separate standalone generator can also be found.

For further details and tuition in C and BCPL, many books are available.

The standard C text is *The C Programming Language* by Kernighan and Ritchie, the inventors of the language, published by Prentice Hall. A new edition covers the Ansi standard for C.

A more explanatory and less formal approach is taken in *C – A Dabhand Guide* by Mark Burgess published by Dabs Press.

For BCPL users, a good text is *BCPL – The Language and its Compiler* by Martin Richards and Colin Whitby-Strevens. This is published by the Cambridge University Press.

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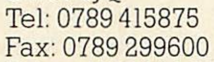
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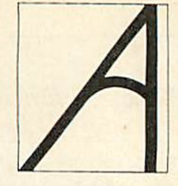


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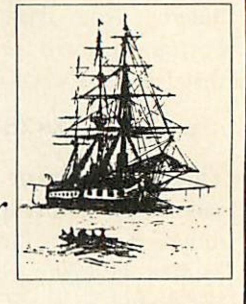
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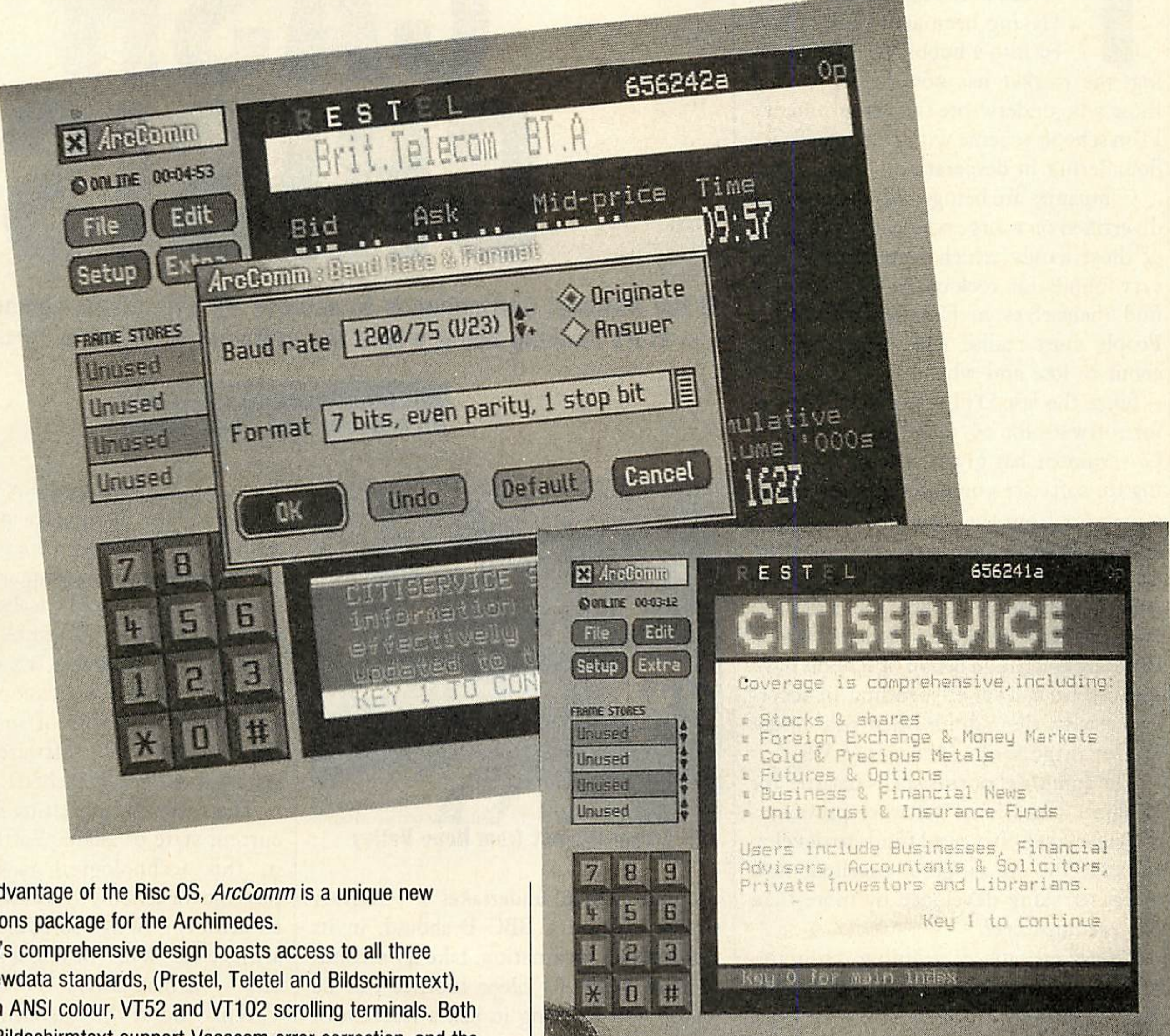
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Taking full advantage of the Risc OS, *ArcComm* is a unique new communications package for the Archimedes.

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The package has been produced with ease of use as a priority. All screen displays are clear and uncluttered, with pop-up menus and dialogue boxes making control as simple as possible.

You won't have to remember strings of numbers! Its telephone number list allows you to dial and log-on automatically. You can store viewdata frames while on line, edit and upload mailboxes, and load/save frames or screens onto disc.

While communicating, it makes use of the full screen, rather than running in a desktop window. But you can return to the desktop at any time, and *ArcComm* remains running as an icon on the icon bar. You can use other desktop software while *ArcComm* stays on-line but inactive. And clicking on the icon brings back full-screen communication.

You can automate the log-on sequence for any comms service, by using *ArcComm*'s own procedure language. This allows you to log-on, set up the correct terminal emulation and all your preferences through a single menu selection.

ArcComm supports Hayes, DTI and manual modems, with details of how to write drivers for other modems in the User Guide provided. You will need Risc OS to use the package, and 1 Mbyte or more of memory. The package costs £29.95.

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CASH CRISIS

If the National Curriculum is to achieve its objectives, someone better start thinking about where the software is going to come from

Nick Evans* and *Chris Drage

The educational software industry is in a crisis unlikely to be solved in the foreseeable future. Having been artificially inflated into a bubble by DTI funding, the market has now burst, leaving those who underwrote the Government's IT in schools scheme with their creativity floundering in desperation.

Companies are being sold, dissolved or diversified on a large scale and even some of those names which seemed to be the very foundation rock of the industry now find themselves in financial difficulties. People must realise what it is they are about to lose and why.

Since the last DTI scheme, which was for software for 16/32 bit machines, the Government has given schools no funding for software purchases, despite representations from the industry.

Schools which are now concentrating on the imminent National Curriculum have no funds to spare for software. Advisers and computer centres which formerly bought on behalf of schools have reduced their level of spending in accordance with their diminished role under local management of schools (LMS).

The sum total of this spells disaster for Britain's educational software producers at a time when they need funds to develop software for the range of excellent new machines being developed by more than one manufacturer.

The overheads of training programmers, equipment purchase and investment in projects is too great for software houses which are already walking a tightrope. You may imagine that companies like 4Mation and Sherston are huge multinationals headed by bloated plutocrats, but Neil Souch and Mike Matson of 4Mation and the wind-surfing Bill Bonham and his staff at Sherston would put you straight.

Make no mistake, you need to be hugely successful in the educational software game even to make a reasonable living. However, without these companies, the machines that sit in the corner of your classroom or in your computer room are worthless. Computers need software just as software needs computers.

But are new machines a step in the right direction? Not everyone believes that the new generation of computers are a benefit. Many of our software houses are adopting a policy of 'wait and see' and not just for financial reasons.

For instance, is it an advance that a program which undertakes a relatively simple task on a BBC B should, in its Archimedes incarnation, take 45 seconds to load when its older brother can be loaded and working in just a fraction of the time?


The Arthur Project from Nene Valley

On the other hand, who could deny that the 'front end' of many of the new machines is more friendly, easier to handle and generally facilitates the interaction between user and computer.

Who can deny the speed at which data may be handled, tasks performed and images generated?

Is it an advance that Beeb programs which printed in black and white are now presenting amazing 256 colour graphics and print only in colour because it is almost impossible to render that number of colours as black and white print.

Is it an advance that people using the new machines seem to have no time for computer assisted learning programs and that, generally, only a range of complex computer tools have been developed?

But again, who can deny that 256 colours on screen and near-photographic imaging is of benefit to users of all ages.

But are these the questions we should be asking? How about this one: what do schools want? If you were to do a sample of ordinary (non-computer specialist) teachers you would probably get the answer 'a BBC B', since we are all conservative. However, a more informed response might be, 'computers which have as wide a body of software as the Beeb', since it is the software and nothing else that interests teachers.

This raises an interesting fact about the current state of affairs. For the first time in this technological race it is now possible for schools to say 'What do I want to achieve? What software is there to achieve it? What machine shall I run it on?' – in that order!

What does the government think? Well, these are the answers you'll get from the DES and DTI. They are interested in placing machines in schools and software is a side issue which they feel ought to be determined by market forces. However, it is strange that they don't think the hardware industry should be governed by those same forces.

So, what answers can be given to these points? How can such attitudes be countered?

Computers in schools can only work with software. New software is quite pricey but schools must be prepared to pay the going price or there will simply be no software to buy. The only alternative is Government subsidy.

The software industry cannot follow market forces because there is not a sufficient market. Only with Government support is it likely to survive. The market has been constrained by a policy which demands the purchase of non-

standard British machines. This isn't necessarily a bad thing, but without a demand for British software it is doomed to failure.

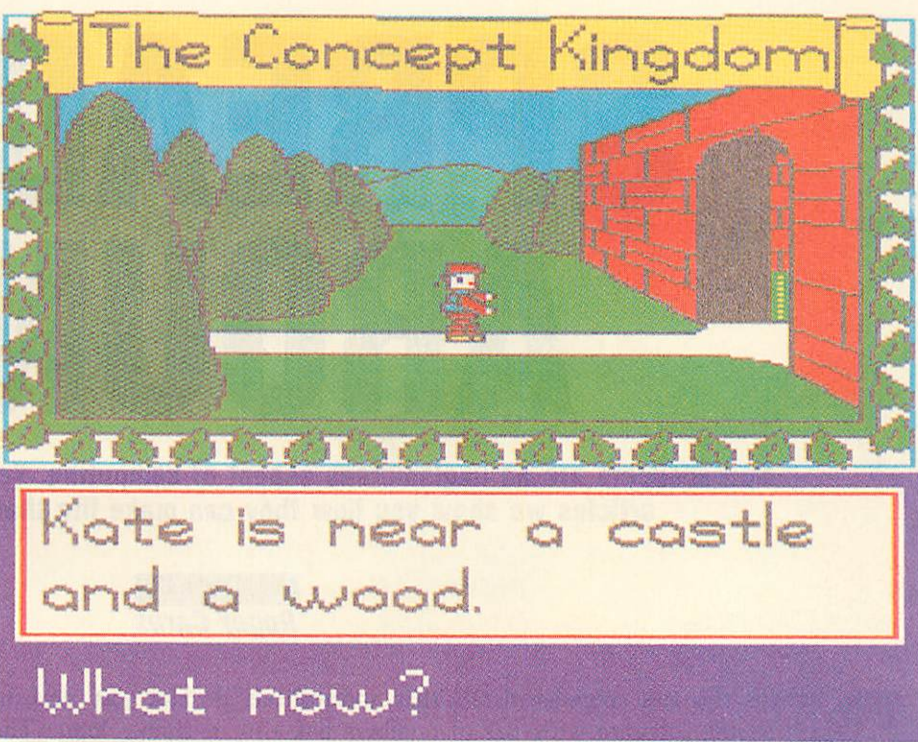
The only way to viability is to exploit other markets. Although Australia and New Zealand, some parts of Canada, Sri Lanka, India and so on run BBC micros, they are in a minority. The world is MS-Dos, except for Japan and with the exception of the inroads made by Apple (which are significant). To be fair, that description of the world is in itself a generalisation since the Americans, who one always considers to be the epitome of MS-Dos are bemoaning the fact that there is no universal standard.

Schools will certainly need to budget for software, but if they are to fulfil the requirements of the National Curriculum, how many schools have sufficient machines, sufficient software, sufficient cash and sufficient expertise to implement the Government's demands? A software package is different from a book in that it is more expensive, more flexible (if it is of any value) and has therefore a higher level of priority. This software phenomenon only recently impinged on schools' budgets, but where is the increased funding for a more technological classroom environment, led by a higher-tech National Curriculum to come from?

The Design and Technology Working Party Report for the National Curriculum Council has laid out a plan to bring the education system kicking and screaming into the 20th century. The placing of our lessons in a context which has meaning, where children's tasks and the acquisition of knowledge have a framework which means something to them, and is an important step towards making education work for its living.

Software which supports this process cannot come out of thin air. It must be developed by informed agencies, recognising the needs of the curriculum and creating appropriate responses to the changes in emphasis in the educational system. Moreover, it must be up-to-the-minute and based in the reality of the outside world.

What does that mean? Basically, that unless school children use tools which are broadly similar to those in the outside world, they will find the transfer of training more difficult than they need to. They should be able to wordprocess, handle information systems, present information in a clear form, handle simple control and monitoring devices, create models of situations and things using IT tools – indeed all the range of tasks and skills that permeate the National Curriculum.



The Concept Kids: A new puzzle-solving adventure from Sherston Software

In addition, those same powerful tools and the machines that run them need to be exploited in the learning process. The computer gives us a dynamic context for learning. Software for the earlier machines has shown how liberating the computer can be, how stimulating, how provoking and how much it can act as a catalyst in the classroom.

If you are not a business person you may not realise the problems involved in judging a market. To create a new program for the Arc, for instance, will perhaps require 700 hours work. If the package does not sell, who pays the bills? What happens if the entire country decides to vote with its feet and continues buying only Masters? Which machine should you have written software for?

Unfortunately, and through no fault of theirs, most teachers think of computer software as something which comes free from their computer centre or at around £15-20 per pack. Most industrial software begins at around £500 where it is expected to earn its living.

One software house, called up recently, was asked what software it was creating for the Archimedes. On hearing the reply the horrified teacher exclaimed 'Only one package? That's not going to get me very far!' That same teacher will undoubtedly expect the result at the end of a year's work to cost £15 or he'll not buy it.

None of this is helped by organisations which sell software at below cost price, for that is certainly the case with some government – and local government-funded agencies whose products undermine an already fragile software publishing industry.

What will be left if the trend continues? Software companies which go to the wall are already being mopped up by distributors and other companies – a good thing too or those products would disappear entirely.

That trend may become more prevalent and software supply will become the domain of a few large organisations. More probably, it will devolve down to the government organisations some of whose activities are already helping to bring about the breakdown of the industry.

The autonomy of the software producers will go and with it, I suspect, the initiative, flair and sparkle that makes our educational software some of the best and most creative in the world?

The solution? Money of course. Money for schools to spend where they want to spend it without software being locked out as an expensive extra. Money to sustain development with development projects funded by government, industry and business to help provide the calibre of school leavers they want to see.

SPREAD IT AROUND

Spreadsheets are an unglamorous aspect of computing. Yet, in this, the first of two articles we show you how they can make life that little bit easier

Roger Carus

Perhaps the least popular data processing software with BBC micro users is the old faithful spreadsheet. The national aversion to anything remotely involving numbers has given the spreadsheet an unpopularity it really does not deserve, and yet it can be very useful in many kinds of ways.

Without being technical, it is best to think of a spreadsheet as a way of organising large sheets of paper lightly ruled in squares, so you can write anything you like on them. Each square has a limited amount of space and is referred to with a cross reference like a map.

In each space you can write simple labels (like words), values (such as '1234') or formulae ('A1 * B2' M in which case it will multiply the contents of square A1 by those in B2, and show the result). If you write in the name of another square it automatically copies what is there.

You do not need to use spreadsheets for numbers only: the easiest way to make keystrips for your micro is to arrange the squares to allow them to be entered easily and then type in the chosen names ready for printing. Another use I have seen is to make table plans and conference labels at the same time. You can use spreadsheets any time when it is not very convenient to write in lines as a wordprocessor does, and you want to go from one part of a document to another quickly.

Of course spreadsheets are magnificent number crunchers but they can be useful in other ways. With a little ingenuity they are capable of helping far more people than is understood. The reason for this is that spreadsheets do not just deal in numbers but also in simple logic. The beauty of this is that it can take the emotion out of a decision and let it become abstract: once the data is collected and analysed it gives you the 'perfect' objective answer in logical terms and you can then build in the subjective considerations to make it acceptable.

For example, a few years ago I was involved with a problem which was worrying a group of headteachers of neighbouring secondary schools: where to offer the A-level courses given that no one school had enough pupils to make reasonable groups? I suggested that we make the decision objective. First, we made a list of the schools and from our knowledge of the area we worked out where it would be easiest for the pupils of one school to go if their own did not offer the course. Then we put the list in some kind of order.

We then decided the minimum acceptable number in a group would be 10 and started to go through the subjects with the current number of pupils, trying to agree where the subjects should be provided. It was a tedious job and very sensitive so I suggested we use a computer. In fact, the task proved easy to do with the help of a simple spreadsheet which took me an evening to design.

I then produced basic proposals from 18 subjects, neatly printed in an hour. Then all the results were put together in a short summary.

The logical tables looked something like the ones shown opposite and could have been produced easily with paper and pencil. The computer, however, made it more precise and convincing.

I am sorry to say the headteachers' arguments went on even more vigorously afterwards but they moved to the emotive issue of the morality of making human decisions with computers.

Masses of figures

Most uses for which spreadsheets are best known involve handling and processing masses of figures presented in tables. These typically involve financial data or statistics, and I grow weary of articles showing how easy it is to recalculate lists of prices showing VAT separately or calculating costings. The computer is ideal for these jobs but it is also capable of much more.

Any dull repetitive job which calls for large numbers of similar calculations done with accuracy is ideal for the computer and spreadsheet.

Part of the problem of writing about all kinds of spreadsheets is that we each have different personal requirements and a column of someone else's figures is not of much interest to most of us. Whether it is work or leisure, all money matters and calculations are very personal and the details are neither interesting nor easy for others to follow.

One thing which we all have to face is income tax and it may be helpful to take an example which I regularly use to help people judge what they can expect to receive in net monthly pay.

I should explain that it has been built up over the years and is part of a much larger sheet which does other things also.

```
      A             B       C      D  E       F      G     H         I         J  K      L       M       N      O      P
 1                                                                   Taxable      13195
 2                                    Tax band Cumulat Rate Tax on band
 3                                     20700   20700   25      5175
 4                                     99999  120699   40     40000
 5
 6  GROSS INCOME              17000                                                      Taxed           Amount
 7  SUPERANNUATION    1020                                           Taxed at               at               at Cum.   Tax
 8  NI                1427                                           Tax band   %         rate            rate annual monthly
 9  DEDUCTIONS                 2447                                    20700   25  13195  13195    3299   3299   3299     275
10  NET INCOME                14553                                    99999   40 (7505) (7505) (3002)     0   3299     275
11  CODED ALLOWANCES 2785
12  TAXABLE INCOME            13195
13  HENCE TAX                  3299
14  NET ANN. INCOME           11254
15  NET M'LY INCOME          937.85
```

Figure 1. The entire sample spreadsheet – area A1 P15

```
      A              B       C
 6  GROSS INCOME            17000         A6:   L  GROSS INCOME
 7  SUPERANNUATION   1020                 A7:   L  SUPERANNUATION
 8  NI               1427                 A8:   L  NI
 9  DEDUCTIONS               2447         A9:   L  DEDUCTIONS
10  NET INCOME              14553         A10:  L  NET INCOME
11  CODED ALLOWANCES 2785                 A11:  L  CODED ALLOWANCES
12  TAXABLE INCOME          13195         A12:  L  TAXABLE INCOME
13  HENCE TAX                3299         A13:  L  HENCE TAX
14  NET ANN. INCOME         11254         A14:  L  NET ANN. INCOME
15  NET M'LY INCOME        937.85         A15:  L  NET M'LY INCOME

                                          B7:   V  ((6*C6)/100)
                                          B8:   V  1427
                                          B11:  V  2785

                                          C6:   V  17000
                                          C9:   V  B7+B8
                                          C10:  V  C6-C9
                                          C12:  V  C6-B7-B11
                                          C13:  V  O10
                                          C14:  V  C10-C13
                                          C15:  V  C14/12
```

Figure 2. Sheet visible on screen with entries visible on right – area A6 C15

```
     E        F     G      H          I       J  K
1                                   Taxable      13195        E2:   L  Tax bands
2  Tax band Cumulat Rate Tax on band                          E3:   V  20700
3    20700   20700  25        5175                            E4:   V  99999
4    99999  120699  40       40000
                                                              F2:   L  Cumulative
                                                              F3:   V  E3
                                                              F4:   V  F3+E4

                                                              G2:   L  Rate
                                                              G3:   V  25
                                                              G4:   V  40

                                                              H2:   L  Tax on band
                                                              H3:   V  E3*G3/100
                                                              H4:   V  E4*G4/100

                                                              I1:   L  Taxable salary =

                                                              K1:   V  C12
```

Figure 3. Sheet visible on screen with entries visible on right – area E1 K4

```
       I       J    K       L       M       N      O      P         I7:   L  Taxed at
 6                        Taxed           Amount                    I8:   V  E2
 7  Taxed at                 at               at Cum.   Tax         I9:   V  E3
 8  Tax band   %           rate            rate annual monthly      I10:  V  E4
 9    20700   25  13195  13195    3299   3299   3299     275
10    99999   40 (7505) (7505) (3002)      0   3299     275         J8:   L  %
                                                                    J9:   V  G3
                                                                    J10:  V  G4

                                                                    K9:   V  K1
                                                                    K10:  V  K1-E3

                                                                    L6:   L  Taxed
                                                                    L7:   L  at
                                                                    L8:   L  rate
                                                                    L9:   V  IF(K9>I9,I9,K9)
                                                                    L10:  V  IF(K10>I10,I10,K10)

                                                                    M9:   V  IF(K9>E3,H3,(J9/100)*K9)
                                                                    M10:  V  IF(K10>E4,H4,(J10/100)*K10)

                                                                    N6:   L  Amount
                                                                    N7:   V  L7
                                                                    N8:   V  L8N8
                                                                    N9:   V  IF(M9>0,M9,0)
                                                                    N10:  V  IF(M10>0,M10,0)

                                                                    O7:   L  Cum.
                                                                    O8:   L  annual
                                                                    O9:   V  N9
                                                                    O10:  V  O9+N10

                                                                    P7:   L  Tax
                                                                    P8:   L  monthly
                                                                    P9:   V  O9/12
                                                                    P10:  V  O10/12
```

Figure 4. Sheet visible on screen with entries seen on right – area I6 P10

The complete sheet shown in figure 1 occupies 16 by 15 cells (or boxes), but people are really only interested in the results which appear in the 30 cells (A6.C15) shown in figure 2.

On the screen that is all that would be shown and even the headings of ABC and 6 to 15 would be hidden. I am assuming readers are familiar with the basic mechanics of entering data on a spreadsheet which have often been written about and I will deal here only with how the sheet is constructed and used.

A taxing problem

With a little knowledge of the tax system you can create this first panel. Taking a known salary, you know superannuation has a fixed relationship to it (in this case six per cent). National insurance contributions are more difficult since there is no simple formula, and to make my example simpler I have left out what is known as a lookup table' for calculating NI and just taken a flat figure which applies above £16,900 pa. Tax codes are prepared by the Inland Revenue and you pay tax on income less superannuation and allowances with the calculations being done in the other parts of the sheet.

Beside the table is printed what appears in the boxes, although you only see the result on the screen. The 'address' is in the first column, and the type of box in the second: 'L' indicates a label and 'V' a value or calculation. For example Cell C15 commands the computer to divide Cell C14 by 12 to show the annual income in monthly form, and it has been formatted to present it to two decimal places (although the format instruction is not visible on screen). Cell C13 brings the amount of tax payable back from the invisible part of the sheet.

Figure 3 shows the general tax structure with the first £20,700 at 25% and above that at 40%. These parts may need to be altered after a Budget. To save space I have not printed all of the titles so you will see for example that I1 has been truncated.

This then leads to figure 4 where the calculation is done in an accurate and ingenious way, even if it is not very elegant. Cell L9 is the key to the calculation and took considerable thought. It says IF(K9>I9,I9,K9).

Translated that means if the contents of K9 (which is the same as K1, the taxable income) are greater than I9 (the £20,900 taxed at 25%) then write in I9 (20,900) but if it is less then put in the actual figure in K9 which in this case is 13195. Because it is less, K10 becomes negative or minus 7505. Column M then calculates the tax at the rates in column J and enters them in column N, provided that they are positive and a cumulative total is shown in column O with the monthly figure in column P.

The annual figure is then taken back to the visible table in Cell C13 which allows the net income to be calculated. It may sound complicated but once entries are made of the salary in Cell C6 and tax code in B11 then with three pressings of the recalculate key the superannuation, tax and monthly income can be shown immediately to 15 places of decimals and printed if required.

In the full version the National Insurance is also calculated.'

Room for more

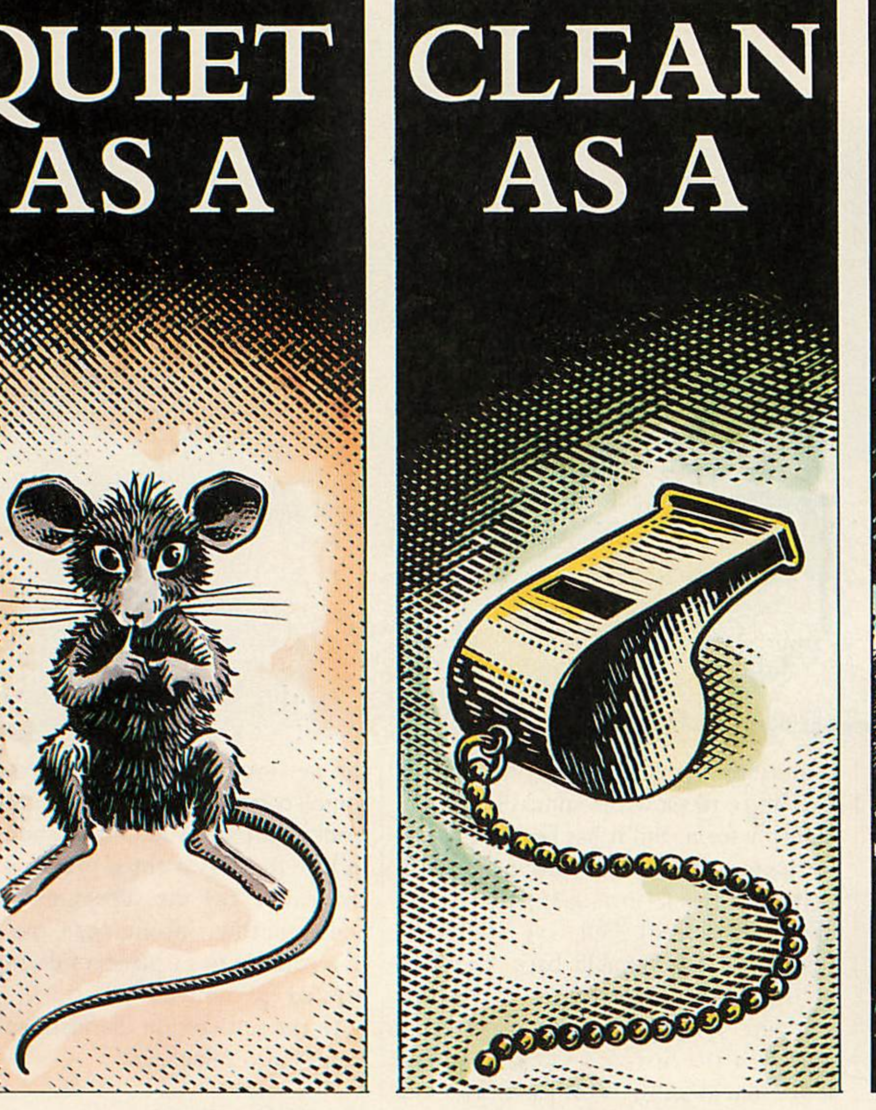
This model occupies only four per cent of the BBC B memory of 32K in mode 7 and 10 per cent in mode 3 so there is plenty of room for much more. In fact this is part of a very much larger and more complicated sheet which includes the income from taxable investment capital and is designed to compare net income before and after retirement – a subject I often need to give advice on and where accurate figures are very much appreciated by those considering stopping work.

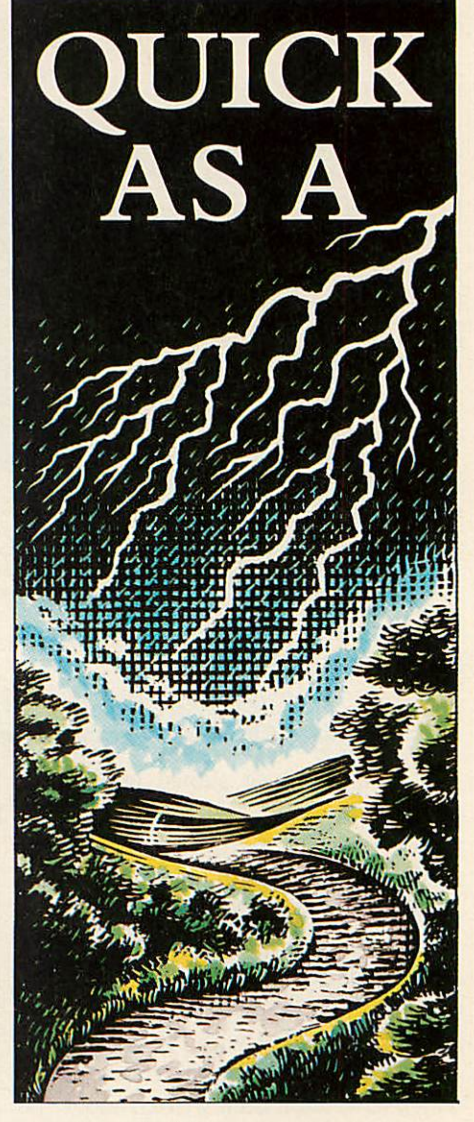
It is as well to remember that complicated tables like this are built up in small bits from basic ideas or problems and you go on improving them with time. Never sit down and expect to pre-plan the whole table in theory and then construct it. It doesn't work!

Next month I will look at some of the types of calculations which can be done, the other functions on offer like conversion to text and graphics and a little of what is on the market today.

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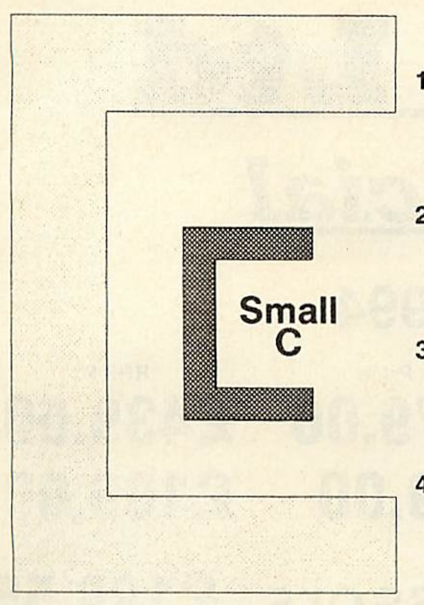


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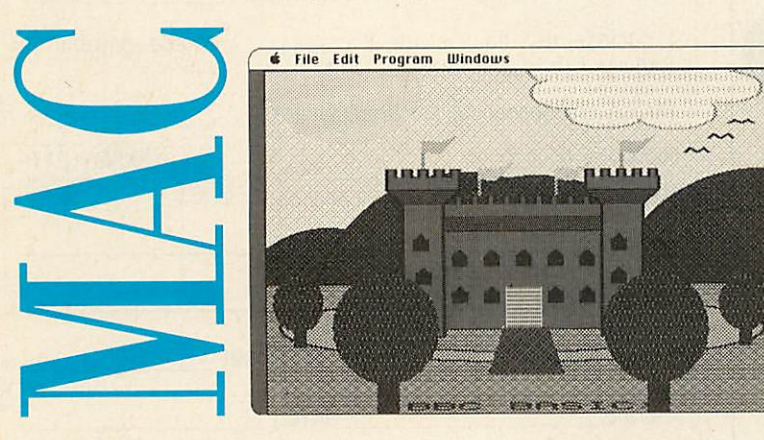
• **A comprehensive Help system** gives you instant information on keywords and operators, without interrupting what you are doing.

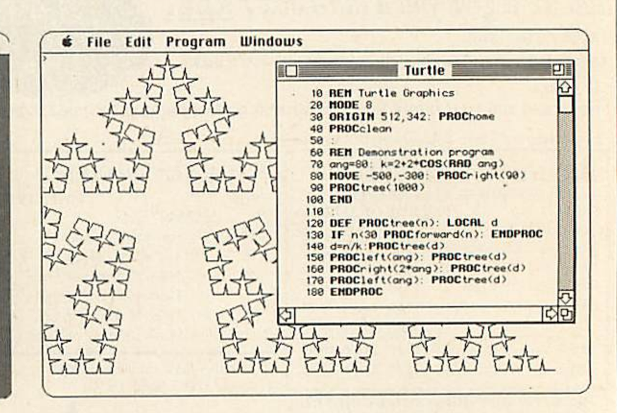
• **A Macintosh Toolbox interface** allows you to define your own menus, dialogue boxes, and scrolling lists using convenient BASIC keywords, and use the standard file dialogues for opening and saving data files.

The BBC BASIC package contains:

- One 800K disc containing BBC BASIC, File»Mac, and example programs
- BBC BASIC User Guide
- BEOS Reference Guide
- BBC BASIC Examples booklet







AU11/89

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COMPATIBILITY

Program	Page	BBC B	B+/128	Master 128	Master Compact	Electron	Arc	6502SP/ Turbo	ADFS	Econet	Shadow RAM	Monthly Disc
Arc Agora	97											
Listings 1–5							■		■	■	■	■
Hints & Tips	98											
Listing 1		■	■			■		■	■	■	■	■
Listing 2		■	■	■	■	■	■	■	■	■	■	■
Listing 3		■	■	■	■	■		■	■	■	■	■
Listing 4		■	■	■	■	■		■	■	■	■	■
Listing 5		■	■	■	■	■		■	■	■	■	■
Fireworks	100											
Listing 1		■	■	■	■			■	■	■	■	■
Listing 2		■	■	■	■	■	■	■	■	■	■	■
Listing 3							■		■	■	■	■
Listing 4							■		■	■	■	■
Put up Job	102											
Listings 1–7			■	■	■			■	■	■	■	■
Drive	107											
Listings 1–4		■	■	■	■			■	■	■	■	■
Compilers	110											
Listings 1–13							■		■	■	■	■

Note. 1. Requires DFS

ARC AGORA

See Arc Agora, page 30

Listing 1.

```
   10 REM >Agora1
   20 REM Prime Finder
   30 REM by P Fobbester
   40 REM for Archimedes only
   50 REM (c) BAU November 1989
   60 :
   70 MODE 0
   80 TIME=0
   90 @%=5
  100 CLS
  110 DIMN%(10000)
  120 S%=2
  130 WHILES%<=100
  140 FORX%=S%*2TO10000STEPS%:N%(X%
)=TRUE:NEXT
  150 REPEATS%+=1:UNTILNOTN%(S%)
  160 ENDWHILE
  170 FORN%=3TO10000STEP2:IFNOTN%(N
%) PRINTN%;
  180 NEXT
  190 PRINTTIME
```

Listing 2.

```
   10 REM >Agora2
   20 REM Prime Finder
   30 REM by Barney Hamilton
   40 REM for Archimedes only
   50 REM (c) BAU November 1989
   60 :
   70 MODE 0
   80 DIM buffer 100,org 3000
   90 useful=1:wipeout=2:space=3
  100 base=4:number=5:prime=6
  110 size=7:arraypointer=8
  120 mstringl=9:stringp=10:mask=11
  130 basicreturn=12:link=14
  140 sz=10000
  150 sz=sz/2
  160 B%=sz AND &FF00
  170 F%=sz DIV 32
  180 H%=sz
  190 D%=(SQR(sz*2))
  200 FOR pass%=0 TO 2 STEP 2
  210 P%=org
  220 [OPT pass%
  230 .sieve
  240 MOV basicreturn,link
  250 ADR stringp,buffer
  260 MOV mstringl,#0
  270 ADR base,thearray
  280 MVN mask,#0
  290 MOV arraypointer,base
  300 .start
  310 STR mask,[arraypointer],#%100
  320 SUBS number,number,#1
  330 BNE start
  340 LDR useful,[arraypointer]
  350 MOV mask,mask,LSR #FNshift
  360 ORR useful,useful,mask
  370 STR useful,[arraypointer]
  380 MOV number,#0
  390 .loop
  400 MOV arraypointer,number,LSR #
5
  410 MOV mask,#1
  420 AND useful,number,#%11111
  430 MOV mask,mask,LSL useful
  440 LDR useful,[base,arraypointer
,LSL #2]
  450 ANDS useful,useful,mask
  460 BEQ end
  470 ADD prime,number,number
  480 ADD prime,prime,#3
  490 .print
  500 MOV R0,prime
  510 ADD R1,stringp,mstringl
  520 MOV R2,#72
  530 SWI "OS_BinaryToDecimal"
  540 ADD mstringl,mstringl,R2
  550 MOV R2,#32
  560 STRB R2,[stringp,mstringl]
  570 ADD mstringl,mstringl,#1
  580 CMP mstringl,#72
  590 MOVGT R0,#10
  600 STRGTB R0,[stringp,mstringl]
  610 MOVGT R0,#13
  620 ADDGT mstringl,mstringl,#1
  630 STRGTB R0,[stringp,mstringl]
  640 ADDGT mstringl,mstringl,#1
  650 MOVGT R0,stringp
  660 MOVGT R1,mstringl
  670 SWIGT "OS_WriteN"
  680 MOVGT mstringl,#0
  690 ADD wipeout,prime,number
  700 CMP prime,R3
  710 BGT end
  720 .again
  730 CMP wipeout,size
  740 BGT end
  750 MOV arraypointer,wipeout,LSR
#5
  760 AND useful,wipeout,#%11111
  770 MOV mask,#1
  780 MOV mask,mask,LSL useful
  790 LDR useful,[base,arraypointer
,LSL #2]
  800 BIC useful,useful,mask
  810 STR useful,[base,arraypointer
,LSL #2]
  820 ADD wipeout,wipeout,prime
  830 B again
  840 .end
  850 ADD number,number,#1
  860 CMP number,size
  870 BLT loop
  880 MOV R0,stringp
  890 MOV R1,mstringl
  900 MOV R2,#72
  910 SWI "OS_WriteN"
  920 MOV R15,basicreturn
  930 .thearray
  940 ]
  950 P%=P%+sz/8
  960 NEXT
  970 TIME=0
  980 CALL sieve
  990 PRINT
 1000 T%=TIME
 1010 PRINT "Time="T%/100" seconds"
 1020 END
 1030 :
 1040 DEF FNshift=32-sz MOD 32
```

Listing 3.

```
   10 REM >Agora3
   20 REM Calendar Procedures
   30 REM by Colin Singleton
   40 REM for Archimedes only
   50 REM (c) BAU November 1989
   60 :
   70 MODE 0
   80 INPUT "Date: "date%
   90 INPUT "Month: "month%
  100 INPUT "Year: "year%
  110 jul%=FNj(date%,month%,year%)
  120 PRINT "Date: ";FNd(jul%);"/";
FNm(jul%);"/";FNy(jul%);
  130 PRINT " fell on a ";
  140 CASE (jul%+2) MOD 7 OF
  150  WHEN 0:PRINT "Monday"
  160  WHEN 1:PRINT "Tuesday"
  170  WHEN 2:PRINT "Wednesday"
  180  WHEN 3:PRINT "Thursday"
  190  WHEN 4:PRINT "Friday"
  200  WHEN 5:PRINT "Saturday"
  210  WHEN 6:PRINT "Sunday"
  220 ENDCASE
  230 PRINT "Julian: ";jul%
  240 PRINT "Easter Day in 19";FNy(
jul%);" falls (fell) on ";
  250 east%=FNe(1900+FNy(jul%))
  260 IF east%<32 THEN
  270  PRINT "March ";east%
  280 ELSE
  290  PRINT "April ";east%-31
  300 ENDIF
  310 END
  320 :
  330 DEF FNj(d%,m%,y%)=d%+((m%+9)
MOD 12*153+2) DIV 5+(y%+(m%<3))*146
1 DIV 4-((y%+(m%<3)) DIV 100+1)*3 D
IV 4
  340 :
  350 DEF FNd(j%)=(((j%*4-1) MOD 14
6097 DIV 4*4+3) MOD 1461 DIV 4*5+2)
 MOD 153 DIV 5+1
  360 :
  370 DEF FNm(j%)=(((j%*4-1) MOD 14
6097 DIV 4*4+3) MOD 1461 DIV 4*5+30
8) DIV 153 MOD 12+1
  380 :
  390 DEF FNy(j%)=(j%*4-1) DIV 1460
97*100+((j%*4-1) MOD 146097 DIV 4*4
+240) DIV 1461
  400 :
  410 DEF FNe(x%)
  420 LOCAL g%,c%,y%,e%,a%,w%
  430 g%=x% MOD 19
  440 c%=x% DIV 100
  450 y%=x% MOD 100
  460 e%=(g%*19+c%-c% DIV 4-(c%*8+1
3) DIV 25+15) MOD 30
  470 a%=(g%+e%*11) DIV 319
  480 w%=(c% MOD 4*2+y% DIV 4*2-y%
MOD 4-e%+a%+32) MOD 7
  490 =e%-a%+w%+22
```

Continued ▶

YELLOW PAGES

HINTS & TIPS

listing 4.

```
   10 REM >Agora4
   20 REM Scaled Text
   30 REM by Alistair Brown
   40 REM for Archimedes only
   50 REM (c) BAU November 1989
   60 :
   70 MODE 12
   80 PROCscaletext(0,3,"This is ha
lf size text",0.5,0.5)
   90 PROCscaletext(0,5,"This is no
rmal size text",1,1)
  100 PROCscaletext(0,7,"This is do
uble height text",1,2)
  110 PROCscaletext(0,10,"This is d
ouble width text",2,1)
  120 PROCscaletext(0,12,"This is d
ouble size text",2,2)
  130 END
  140 :
  150 DEF PROCscaletext(x%,y%,t$,xs
,ys)
  160 LOCAL m%,p%
  170 m%=MODE
  180 p%=2^((m%-(m%>5 AND m%<12 OR
m%=14)) MOD 3+1)
  190 VDU 5
  200 VDU 23,17,7,6,8*xs;8*ys|
  210 MOVE x%*8*p%,1020-y%*32
  220 PRINT t$
  230 VDU 23,17,7,6,8;8|
  240 VDU 4
  250 ENDPROC
```

Listing 5.

```
   10 REM >Agora5
   20 REM European Flag
   30 REM by David Peterson
   40 REM for Archimedes only
   50 REM (c) BAU November 1989
   60 :
   70 MODE 12
   80 PROCinit
   90 PROCeuroflag(300,300,450)
  100 END
  110 :
  120 DEF PROCinit
  130 DIM bx(5),by(5)
  140 COLOUR 0,&90,&90,&90
  150 COLOUR 1,&00,&00,&80
  160 COLOUR 2,&E0,&A0,&00
  170 COLOUR 3,0
  180 VDU 19,0,24,&90,&90,&90
  190 ENDPROC
  200 :
  210 DEF PROCeuroflag(x,y,size)
  220 LOCAL xcentre,ycentre,sx,sy,r
a,angle
  230 GCOL 1
  240 RECTANGLE FILL x,y,(3/2)*size
,size
  250 GCOL 3
  260 RECTANGLE x,y,(3/2)*size,size
  270 xcentre=x+(3/4)*size
  280 ycentre=y+size/2
  290 GCOL 2
  300 FOR angle=0 TO 330 STEP 30
  310 ra=RAD(angle)
  320 PROCstar(xcentre+size/3*COS(r
a),ycentre+size/3*SIN(ra),(1/18)*si
ze)
  330 NEXT
  340 ENDPROC
  350 :
  360 DEF PROCstar(xs,ys,r)
  370 pn=0
  380 FOR points=90 TO 378 STEP (36
0/5)
  390 pn+=1
  400 a=RAD(points)
  410 bx(pn)=xs+r*COS(a)
  420 by(pn)=ys+r*SIN(a)
  430 NEXT
  440 FOR q=1 TO 5
  450 w=q+2:IF w>5 w-=5
  460 e=q+3:IF e>5 e-=5
  470 MOVE bx(q),by(q)
  480 MOVE bx(w),by(w)
  490 PLOT 85,xs,ys
  500 NEXT
  510 ENDPROC
```

See Hints & Tips, page 34

Listing 1.

```
   10 REM LISTIF command
   20 REM by Jason O'Broin
   30 REM for BBC B/B+/E
   40 REM (c) BAU Nov 89
   50 :
   60 IF NOT FNsetup THEN PRINT'"No
t BASIC 1 or 2":VDU7:END
   70 :
   80 FOR pass=0 TO 3 STEP 3
   90 P%=&900
  100 [OPT pass
  110 LDA rom1
  120 STA romnum
  130 LDA #&BB
  140 LDX #0
  150 LDY #&FF
  160 JSR osbyte
  170 STX rom1
  180 STX rom2
  190 LDA #1
  200 LDX #toknptr
  210 LDY #0
  220 JSR osargs
  230 LDA toknptr
  240 STA lneptr
  250 LDA toknptr+1
  260 STA lneptr+1
  270 JSR tline0
  280 LDY #0
  290 .findendspace
  300 LDA (lneptr),Y
  310 CMP #13
  320 BEQ notagain
  330 CMP #32
  340 BNE notagain
  350 INY
  360 JMP findendspace
  370 .notagain
  380 TYA
  390 CLC
  400 ADC lneptr
  410 STA lneptr
  420 LDA lneptr+1
  430 ADC #0
  440 STA lneptr+1
  450 LDA #0
  460 STA memptr
  470 LDA page
  480 STA memptr+1
  490 .entry
  500 LDY #1
  510 LDA (memptr),Y
  520 CMP #255
  530 BEQ exit
  540 JMP line
  550 .agoto
  560 JMP goto
  570 .exit
  580 LDA romnum
  590 STA rom1
  600 STA rom2
  610 RTS
  620 .ret
  630 JSR osnewl
  640 JMP entry
  650 .loop
  660 LDY #0
  670 LDA (memptr),Y
  680 CMP #13
  690 BEQ ret
  700 CMP #32
  710 BCC noprint
  720 CMP #&8D
  730 BEQ agoto
  740 .h
  750 JSR ptoken
  760 .noprint
  770 JSR inc
  780 JMP loop
  790 .showlne
  800 JSR inc
  810 LDY #0
  820 LDA (memptr),Y
  830 STA linenum
  840 JSR inc
  850 LDA (memptr),Y
  860 STA linenum+1
  870 JSR inc
  880 LDA (memptr),Y
  890 LDA linenum+1
  900 LDY linenum
  910 JSR lodiay
  920 JSR plnum5
  930 LDA #1
  940 BIT listo
  950 BEQ dispit
  960 LDA #32
  970 JSR oswrch
  980 .dispit
  990 JMP noprint
 1000 .line
 1010 LDY #0
 1020 STY y1
 1030 LDA (lneptr),Y
 1040 CMP #13
 1050 BEQ showlne
 1060 LDY #4
 1070 STY dist
 1080 .chk2
 1090 STY y2
 1100 .chckit
 1110 CMP (memptr),Y
 1120 BNE moveup
 1130 INC y1
 1140 INC y2
 1150 LDY y1
 1160 LDA (lneptr),Y
 1170 CMP #13
 1180 BEQ showlne
 1190 LDY y2
 1200 JMP chckit
 1210 .moveup
 1220 CMP #13
 1230 BEQ showlne
 1240 INC dist
 1250 LDY dist
 1260 LDA (memptr),Y
 1270 CMP #13
 1280 BEQ nxtlne
 1290 LDY #0
 1300 STY y1
 1310 LDA (lneptr),Y
 1320 LDY dist
 1330 JMP chk2
 1340 .nxtlne
 1350 TYA
 1360 CLC
 1370 ADC memptr
 1380 STA memptr
 1390 LDA memptr+1
 1400 ADC #0
 1410 STA memptr+1
 1420 JMP entry
 1430 .goto
 1440 LDY #0
 1450 JSR inc
 1460 LDA (memptr),Y
 1470 STA linenum
 1480 JSR inc
 1490 LDA (memptr),Y
 1500 STA linenum+1
 1510 JSR inc
 1520 LDA (memptr),Y
 1530 STA linenum+2
 1540 LDA linenum
 1550 CLC
 1560 ASL A
 1570 ASL A
 1580 STA linenum+3
 1590 CLC
 1600 AND #192
 1610 EOR linenum+1
 1620 STA linenum+4
 1630 LDA linenum+3
 1640 CLC
 1650 ASL A
 1660 ASL A
 1670 EOR linenum+2
 1680 TAY
 1690 LDA linenum+4
 1700 JSR lodiay
 1710 JSR plnum0
 1720 JMP noprint
 1730 .inc
 1740 INC memptr
 1750 BNE over
 1760 INC memptr+1
 1770 .over
 1780 RTS
 1790 ]NEXT
 1800 OSCLI"SAVE LISTIF 900 "+STR$~
(P%)
 1810 END
 1820 :
 1830 DEF FNsetup
 1840 page=&18
 1850 listo=&1F
 1860 toknptr=&37
 1870 y1=&A8
 1880 y2=&A9
 1890 dist=&AA
 1900 romnum=&AD
 1910 memptr=&AE
 1920 lneptr=&E2
 1930 linenum=&A8
 1940 rom1=&F4
 1950 rom2=&FE30
 1960 osargs=&FFDA
 1970 osnewl=&FFE7
 1980 oswrch=&FFEE
 1990 osbyte=&FFF4
 2000 basic=(?&8015)-48
 2010 IF basic=1 PROCbasic1:=TRUE
 2020 IF basic=2 PROCbasic2:=TRUE
 2030 =FALSE
 2040 :
 2050 DEF PROCbasic1
 2060 lodiay=&AF19
 2070 plnum0=&98F1
 2080 plnum5=&98F5
 2090 tline0=&88D3
 2100 ptoken=&B53A
 2110 ENDPROC
 2120 :
 2130 DEF PROCbasic2
 2140 lodiay=&AEEA
 2150 plnum0=&991F
 2160 plnum5=&9923
 2170 tline0=&8951
 2180 ptoken=&B50E
 2190 ENDPROC
```

Listing 2.

```
   10 REM Timing for long jobs
   20 REM by David Atherton
   30 REM for B/B+/E/M/C/A
   40 REM (c) BAU Nov 89
   50 :
   60 N%=2E3
   70 TIME=0
   80 FOR I%=1 TO N%
   90 percent=I%/N%
  100 PROCtime(percent)
  110 PROCmtime(percent)
  120 PROCshowtime
  130 PROCmshowtime
  140 NEXT
  150 END
  160 :
  170 DEFPROCtime(pc)
  180 tt%=TIME/100
  190 IF pc=1 THEN torun%=0 : GOTO
210
  200 torun%=tt%/pc-tt%
  210 dtr%=FNtime3(86400)
  220 htr%=FNtime3(3600)
  230 mtr%=FNtime3(60)
  240 str%=torun%
  250 torun$=FNtime2(htr%)+":"+FNti
me2(mtr%)+":"+FNtime2(str%)
  260 ENDPROC
  270 :
  280 DEFPROCmtime(pc)
```

Continued ▶

◀ Continued

```
290 ch%=FNtime4(17)
300 cm%=FNtime4(20)
310 cs%=FNtime4(23)
320 cd$=LEFT$(TIME$,3)
330 cd%=(INSTR("SunMonTueWedThuFr
iSat",cd$)-1)/3
340 now%=ch%*3600+cm%*60+cs%
350 tt%=TIME/100
360 torun%=now%+tt%/pc-tt%
370 etad%=(FNtime3(86400)+cd%) MO
D 7
380 etad$=MID$("SunMonTueWedThuFr
iSat",etad%*3+1,3)
390 etah%=FNtime3(3600)
400 etam%=FNtime3(60)
410 etas%=torun%
420 eta$=FNtime2(etah%)+":"+FNtim
e2(etam%)+":"+FNtime2(etas%)
430 ENDPROC
440 :
450 DEFFNtime2(n%)
460 =RIGHT$("00"+STR$n%,2)
470 :
480 DEFFNtime3(d%)
490 LOCAL t%
500 t%=torun% DIV d%
510 torun%=torun%-t%*d%
520 =t%
530 :
540 DEFFNtime4(pos%)
550 =VAL MID$(TIME$,pos%,2)
560 :
570 DEFPROCshowtime
580 PRINT"Time to completion: ";
590 IF dtr% THEN PRINT;dtr%;" day
s ";
600 PRINT torun$;" ";
610 ENDPROC
620 :
630 DEFPROCmshowtime
640 PRINT"Completion time: ";etad
$;",";eta$
650 ENDPROC
```

Listing 3.

```
10 REM Duplicated label check
20 REM by Joe Abley
30 REM for B/B+/E/M/C
40 REM (c) BAU Nov 89
50 :
60 oswrch = &FFEE
70 osbyte = &FFF4
80 osnewl = &FFE7
90 page   = &18
100 top    = &12
110 buf    = &700
120 bas    = &70
130 stk    = &72
140 src    = &74
150 ptr    = &76
160 length = &78
170 lineno = &79
180 qflag  = &7B
190 num    = &7C
200 pnum   = &7D
210 wk     = &7F
220 scr    = &81
230 :
240 FOR x=0 TO 2 STEP 2
250 P%=&900
260 [OPT x
270 .setup
280 LDA top+1
290 CLC
300 ADC #1
310 STA bas+1
320 STA stk+1
330 LDA #0
340 STA bas
350 STA stk
360 LDA page
370 STA ptr+1
380 LDA #0
390 STA ptr
400 LDA #&FF
410 LDY #0
420 STA (stk),Y
430 LDA #132
440 JSR osbyte
450 STX scr
460 STY scr+1
470 :
480 .main_loop
490 LDY #1
500 LDA (ptr),Y
510 STA lineno+1
520 CMP #&FF
530 BNE notlast
540 RTS
550 :
560 .notlast
570 INY
580 LDA (ptr),Y
590 STA lineno
600 INY
610 LDA (ptr),Y
620 STA length
630 LDA &FF
640 ROL A
650 BCC noesc
660 LDA #&7E
670 JSR osbyte
680 BRK
690 EQUB 17
700 EQUS "Escape"
710 BRK
720 :
730 .noesc
740 LDY #4
750 LDA #0
760 STA qflag
770 STA num
780 :
790 .lineloop
800 CPY length
810 BEQ doneline
820 LDA (ptr),Y
830 INY
840 CMP #32
850 BEQ lineloop
860 CMP #34
870 BEQ quote
880 CMP #ASC(":")
890 BEQ newstatement
900 CMP #ASC(".")
910 BNE nextchar
920 LDA num
930 BNE lineloop
940 LDA qflag
950 BNE lineloop
960 TYA
970 PHA
980 LDX #0
990 .copy
1000 LDA (ptr),Y
1010 STA buf,X
1020 INY
1030 INX
1040 CMP #ASC(" ")
1050 BEQ endoflabel
1060 CMP #ASC(":")
1070 BEQ endoflabel
1080 CMP #&0D
1090 BNE copy
1100 .endoflabel
1110 DEX
1120 LDA #&00
1130 STA buf,X
1140 JSR examine_label
1150 PLA
1160 TAY
1170 JMP nextchar
1180 :
1190 .quote
1200 LDA qflag
1210 EOR #&FF
1220 STA qflag
1230 :
1240 .nextchar
1250 INC num
1260 JMP lineloop
1270 :
1280 .newstatement
1290 LDA #0
1300 STA num
1310 JMP lineloop
1320 :
1330 .doneline
1340 LDA ptr
1350 CLC
1360 ADC length
1370 STA ptr
1380 LDA ptr+1
1390 ADC #0
1400 STA ptr+1
1410 JMP main_loop
1420 :
1430 .examine_label
1440 LDA bas
1450 CMP stk
1460 BNE notempty
1470 LDA bas+1
1480 CMP stk+1
1490 BEQ addlabel
1500 .notempty
1510 LDA bas
1520 STA src
1530 LDA bas+1
1540 STA src+1
1550 LDX #0
1560 LDY #0
1570 .checkloop
1580 LDA buf,X
1590 CMP #0
1600 BEQ label_end
1610 .back_in
1620 CMP (src),Y
1630 BNE nextone
1640 INY
1650 INX
1660 JMP checkloop
1670 .label_end
1680 LDA (src),Y
1690 BEQ displine
1700 LDA buf,X
1710 JMP back_in
1720 :
1730 .nextone
1740 LDA (src),Y
1750 BEQ foundend
1760 INY
1770 JMP nextone
1780 :
1790 .foundend
1800 INY
1810 TYA
1820 CLC
1830 ADC src
1840 STA src
1850 LDA src+1
1860 ADC #0
1870 STA src+1
1880 LDY #0
1890 LDX #0
1900 LDA src
1910 CMP stk
1920 BNE checkloop
1930 LDA src+1
1940 CMP stk+1
1950 BNE checkloop
1960 :
1970 .addlabel
1980 LDX #0
1990 LDY #0
2000 .addloop
2010 LDA buf,X
2020 STA (stk),Y
2030 INY
2040 INX
2050 CMP #0
2060 BNE addloop
2070 TYA
2080 CLC
2090 ADC stk
2100 STA stk
2110 LDA stk+1
2120 ADC #0
2130 STA stk+1
2140 LDA #&FF
2150 LDY #0
2160 STA (stk),Y
2170 LDA stk+1
2180 CMP scr+1
2190 BCC isroom
2200 BRK
2210 BRK
2220 EQUS "No room"
2230 BRK
2240 .isroom
2250 RTS
2260 :
2270 .displine
2280 LDX lineno
2290 LDY lineno+1
2300 JSR printnum
2310 LDX #0
2320 .text
2330 LDA mtext,X
2340 JSR oswrch
2350 INX
2360 CMP #&2E
2370 BNE text
2380 LDX #0
2390 .name
2400 LDA buf,X
2410 JSR oswrch
2420 INX
2430 CMP #0
2440 BNE name
2450 JMP osnewl
2460 :
2470 .printnum
2480 STX pnum
2490 STY pnum+1
2500 LDA #&FF
2510 .ploop1
2520 PHA
2530 LDA #0
2540 STA wk
2550 STA wk+1
2560 LDX #16
2570 .ploop2
2580 ASL pnum
2590 ROL pnum+1
2600 ROL wk
2610 ROL wk+1
2620 LDA wk
2630 SEC
2640 SBC #10
2650 TAY
2660 LDA wk+1
2670 SBC #0
2680 BCC pdone
2690 INC pnum
2700 STY wk
2710 STA wk+1
2720 .pdone
2730 DEX
2740 BNE ploop2
2750 LDA wk
2760 LDY pnum
2770 BNE ploop1
2780 LDY pnum+1
2790 BNE ploop1
2800 .pdigit
2810 CMP #&A
2820 BCC nothex
2830 ADC #6
2840 .nothex
2850 ADC #&30
2860 JSR oswrch
2870 PLA
2880 BPL pdigit
2890 RTS
2900 :
2910 .mtext
2920 EQUS " multiple definition of
."
2930 ]NEXT
2940 :
2950 DIM os &100
2960 $os="SAVE LCHECK 900 "+STR$~P
%+" FFFF0900 FFFF0900"
2970 X%=os MOD &100
2980 Y%=os DIV &100
2990 CALL &FFF7
```

Listing 4.

```
10 REM Reconstruct BASIC program
s in DFS catalogue
20 REM by Joe Abley
30 REM for B/B+/E/M/C with DFS
40 REM (c) BAU Nov 89
50 :
60 DIM block% &20,cat% &200,leng
th%(31),start%(31),n% &20
70 *DISC
80 REPEAT
90 MODE 7
100 VDU 129,157,135
110 PRINT "DFS Recover v1.0"
120 VDU 31,39,0,156
130 VDU 31;23,129,157,135,31,39,2
3,156
140 VDU 28,0,21,39,2
150 INPUT TAB(5,5);"How many trac
ks? "tracks%;TAB(9,7);"Which drive?
 "drive%
160 OSCLI("DRIVE "+STR$(drive%))
170 VDU 23,1,0,0;0;0;0;
180 PRINT TAB(8,18);"Press SPACE
to Continue";TAB(12,19);"(ESCAPE Ab
orts)";
190 *FX 229,1
200 REPEAT
210 key%=GET
220 UNTIL (key%=27 OR key%=32)
230 *FX 229
240 IF key%=27 THEN MODE 7:END
250 CLS
260 :
```

Continued ▶

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```
  270 PROCclear
  280 PROCreset
  290 PROCwrite_cat
  300 PROCscan
  310 PROCclear
  320 PROCfiles
  330 PROCwrite_cat
  340 :
  350 CLS
  360 PRINT TAB(8,12);items%;" BASI
C program(s) found"
  370 PRINT TAB(9,16);"Recover anot
her disk?"
  380 REPEAT
  390 key%=GET
  400 UNTIL key%=89 OR key%=78
  410 UNTIL key%=78
  420 MODE 7
  430 END
  440 :
  450 DEF PROCshow_tracks(t%)
  460 LOCAL a%
  470 FOR a%=0 TO 40*(t%/(tracks%-1
))
  480 a%?&7FC0=255
  490 NEXT
  500 ENDPROC
  510 :
  520 DEF PROCclear
  530 LOCAL a%
  540 FOR a%=0 TO &1FC
  550 cat%!a%=0
  560 NEXT
  570 cat%?&106=(tracks%*10 AND &30
0) DIV &100
  580 cat%?&107=(tracks%*10 AND &FF
)
  590 ENDPROC
  600 :
  610 DEF PROCpoke(a%,s$)
  620 IF s$="" THEN ENDPROC ELSE ?a
%=ASC(s$):PROCpoke(a%+1,MID$(s$,2))
:ENDPROC
  630 :
  640 DEF PROCreset
  650 start%(0)=2
  660 length%(0)=tracks%*&A00-&200
  670 items%=1
  680 PROCfiles
  690 ENDPROC
  700 :
  710 DEF PROCwrite_cat
  720 LOCAL A%,X%,Y%
  730 ?block%=drive%
  740 block%!1=cat%
  750 block%?5=3
  760 block%?6=&4B
  770 block%?7=0
  780 block%?8=0
  790 block%?9=&22
  800 block%?10=0
  810 :
  820 A%=&7F
  830 X%=block% MOD &100
  840 Y%=block% DIV &100
  850 CALL &FFF1
  860 :
  870 IF block%?10<>0 THEN PRINT'"D
isk error &";~block%?10;" at 00/00"
:END
  880 ENDPROC
  890 :
  900 DEF PROCscan
  910 items%=0
  920 in%=FNopenin("$.0")
  930 REPEAT
  940 p%=PTR#in%
  950 PROCshow_tracks((p%+&200) DIV
 &A00)
  960 IF BGET#in%=13 THEN PROCcheck
_BASIC ELSE PTR#in%=p%+&100
  970 UNTIL EOF#in% OR items%=31
  980 CLOSE#in%
  990 ENDPROC
 1000 :
 1010 DEF FNhex(a%,n%)=RIGHT$(STRIN
G$(a%,"0")+STR$~(n%),a%)
 1020 :
 1030 DEF PROCcheck_BASIC
 1040 LOCAL a%,l%
 1050 PRINT " &";FNhex(5,p%+&200);"
: ";FNhex(2,(p%+&200) DIV &A00);"/"
;FNhex(2,((p%+&200) DIV &100) MOD 1
0);" ] BASIC ] ";
 1060 a%=p%
 1070 REPEAT
 1080 PTR#in%=a%
 1090 bad%=(BGET#in%<>13)
 1100 done%=(BGET#in%>127)
 1110 l%=0*BGET#in%+BGET#in%
 1120 a%=a%+l%
 1130 IF l%<4 AND NOT(done%) THEN b
ad%=TRUE
 1140 UNTIL done% OR bad%
 1150 PTR#in%=(a%-l%+&101) AND &FFF
00
 1160 IF bad% THEN PRINT "Bad Progr
am":ENDPROC
 1170 start%(items%)=(p%+&200) DIV
&100
 1180 length%(items%)=a%-l%+2-p%
 1190 PRINT "Length &";~length%(ite
ms%)
 1200 items%=items%+1
 1210 ENDPROC
 1220 :
 1230 DEF PROCfiles
 1240 LOCAL a%
 1250 cat%?&105=items%*8
 1260 IF items%=0 THEN ENDPROC
 1270 FOR a%=0 TO items%-1
 1280 n$=LEFT$(STR$(a%)+STRING$(6,"
 "),7)+"$"
 1290 PROCpoke(cat%+8*(a%+1),n$)
 1300 cat%?(&10C+a%*8)=length%(a%)
AND &FF
 1310 cat%?(&10D+a%*8)=(length%(a%)
 AND &FF00) DIV &100
 1320 cat%?(&10E+a%*8)=(start%(a%)
AND &300) DIV &100 + (length%(a%) A
ND &30000) DIV &1000
 1330 cat%?(&10F+a%*8)=start%(a%) A
ND &FF
 1340 NEXT
 1350 ENDPROC
 1360 :
 1370 DEF FNopenin(a$):REM BASIC 1/
2 compatible
 1380 LOCAL X%,Y%,A%
 1390 $n%=a$
 1400 X%=n% MOD &100
 1410 Y%=n% DIV &100
 1420 A%=&40
 1430 =USR(&FFCE) AND &FF
```

Listing 5.

```
   10 REM List Vector Values
   20 REM by Jason O'Broin
   30 REM for B/B+/E/M/C
   40 REM (c) BAU Nov 89
   50 :
   60 zp     = &A8
   70 store  = &AA
   80 aspare = &AB
   90 lookup = &AC
  100 lokptr = &AE
  110 :
  120 FOR pass=0 TO 3 STEP 3
  130 P%=&900
  140 [OPT pass
  150 .entry
  160 JSR &FFE7
  170 JSR setup
  180 .vec
  190 JSR vec_num
  200 JSR vec_name
  210 JSR vec_addr
  220 INX
  230 LDA zp
  240 LSR A
  250 BCS ret
  260 LDA #134
  270 JSR &FFEE
  280 JSR vec_lookup
  290 LDA #135
  300 JSR &FFEE
  310 .more
  320 LDA zp
  330 CPX #27
  340 BNE vec
  350 JSR &FFE7
  360 RTS
  370 :
  380 .setup
  390 LDA #0
  400 STA zp
  410 TAX
  420 LDA #&2
  430 STA zp+1
  440 LDA &FFB7
  450 STA lookup
  460 LDA &FFB8
  470 STA lookup+1
  480 LDA #0
  490 STA lokptr
  500 RTS
  510 :
  520 .vec_num
  530 LDA zp+1
  540 JSR hex
  550 LDA zp
  560 JSR hex
  570 LDA #32
  580 JSR &FFEE
  590 RTS
  600 :
  610 .vec_name
  620 TXA
  630 PHA
  640 ROL A
  650 ROL A
  660 TAX
  670 LDY #0
  680 .sh_name
  690 LDA name_vec,X
  700 JSR &FFEE
  710 INX
  720 INY
  730 CPY #4
  740 BNE sh_name
  750 PLA
  760 TAX
  770 LDA #131
  780 JSR &FFEE
  790 RTS
  800 :
  810 .ret
  820 JSR &FFE7
  830 JMP more
  840 :
  850 .vec_addr
  860 LDY #0
  870 INC zp
  880 LDA (zp),Y
  890 JSR hex
  900 DEC zp
  910 LDA (zp),Y
  920 JSR hex
  930 INC zp
  940 INC zp
  950 RTS
  960 .vec_lookup
  970 LDY lokptr
  980 INY
  990 LDA (lookup),Y
 1000 JSR hex
 1010 DEY
 1020 LDA (lookup),Y
 1030 JSR hex
 1040 INY
 1050 INY
 1060 STY lokptr
 1070 RTS
 1080 :
 1090 .hex
 1100 STA store
 1110 TXA
 1120 PHA
 1130 TYA
 1140 PHA
 1150 LDA store
 1160 LSR A
 1170 LSR A
 1180 LSR A
 1190 LSR A
 1200 JSR prihex
 1210 LDA store
 1220 AND #15
 1230 JSR prihex
 1240 PLA
 1250 TAY
 1260 PLA
 1270 TAX
 1280 LDA store
 1290 RTS
 1300 :
 1310 .prihex
 1320 STA aspare
 1330 LDX #0
 1340 .prloop
 1350 INX
 1360 LDA hex_dig,X
 1370 CPX aspare
 1380 BNE prloop
 1390 JSR &FFEE
 1400 RTS
 1410 :
 1420 .hex_dig
 1430 EQUS "0123456789ABCDEF"
 1440 :
 1450 .name_vec
 1460 EQUS "USER BRKIRQ1IRQ2 CLIBYT
EWORDWRCHRDCHFILEARGSBGETBPUTGBPBFI
ND FSCEVNT UPT NET VDU KEY INS REM
CNPIND1IND2IND3"
 1470 ] NEXT
 1480 OSCLI "SAVE VecList 900 "+STR
$~(P%)
```

See Fireworks, page 72

Listing 1.

```
   10 REM Beeb Rockets
   20 REM by Norman Cadel
   30 REM for B/B+/M/C
   40 REM (c) BAU November 1989
   50 :
   60 MODE 1
   70 VDU 23;8202;0;0;0;
   80 PROCinit
   90 :
  100 REPEAT
  110 CLS
  120 X%=RND(1279):Y%=RND(100):H%=R
ND(500)+300:D%=RND(3)-2
  130 PROCrocket(X%,Y%,H%,D%,RND(3)
)
  140 PROCrocket(X%,Y%,H%,D%,0)
  150 :
  160 N%=RND(2)+4:Z%=RND(5)
  170 SOUND &10,0,0,1
  180 FOR R%=0 TO 200 STEP 30
  190 PROCcircle(A%,B%,R%,3-(R% DIV
66))
  200 V%=15-(Z%-SIN(RAD(R%/2))*15)
  210 SOUND 0,V%,N%,3
  220 PROCcircle(A%,B%,R%-30,0)
  230 NEXT R%
  240 CLS
  250 UNTIL 0
  260 END
  270 :
  280 DEF PROCinit
  290 ENVELOPE1,133,4,0,0,255,0,0,0
,0,0,0,0,0
  300 sides=10
  310 DIM X(sides),Y(sides),Z(90)
  320 FOR X%=0 TO 90
  330 Z(X%)=SINRAD(X%)
  340 NEXT X%
  350 FOR A%=0 TO 360 STEP (360/sid
es)
  360 X(A%/(360/sides))=SINRAD(A%):
Y(A%/(360/sides))=COSRAD(A%)
  370 NEXT A%
  380 ENDPROC
  390 :
  400 DEF PROCrocket(X%,Y%,H%,D%,C%
)
  410 VDU 29,X%;Y%;
  420 GCOL 0,C%
  430 IF C%<>0 THEN SOUND 1,1,200,2
0:SOUND 0,-6,7,20
  440 FOR I%=0 TO 90
```

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```
450 PLOT 69,I%*D%,Z(I%)*H%
460 NEXT I%
470 A%=X%+(90*D%):B%=Y%+(Z(90)*H%
)
480 ENDPROC
490 :
500 DEF PROCcircle(X%,Y%,R%,C%)
510 VDU 29,X%;Y%;
520 GCOL 0,C%
530 FOR P%=0 TO sides
540 PLOT 69,X(P%)*R%,Y(P%)*R%
550 NEXT P%
560 ENDPROC
```

Listing 2.

```
10 REM Fountain
20 REM by Norman Cadel
30 REM for B/B+/M/C/E/A
40 REM (c) BAU November 1989
50 :
60 MODE 2
70 VDU 23;8202;0;0;0;
80 PROCinit
90 :
100 FOR I%=1 TO 35
110 FOR J%=0 TO 10 STEP 5
120 H%=RND(400)+400:W=RND(20)/6
130 P%=RND(50)+615
140 D%=(P%<640)-(P%>640)
150 PROCrocket(H%,D%,W)
160 NEXT J%
170 NEXT I%
180 PROCmove
190 END
200 :
210 DEF PROCrocket(H%,D%,W)
220 O%=RND(5):C%=RND(5)
230 VDU 29,P%;0;:MOVE 0,0
240 FOR X%=0 TO 120
250 GCOL 0,C%+J%
260 DRAW X%*D%*W,Y(X%)*H%
270 IF X% MOD 3=0 THEN C%=C%+1:IF
C%=6 C%=1
280 NEXT X%
290 ENDPROC
300 :
310 DEF PROCinit
320 DIM Y(120)
330 FOR X%=0 TO 120
340 Y(X%)=SINRAD(X%)
350 NEXT X%
360 ENDPROC
370 :
380 DEF PROCmove
390 c=1
400 REPEAT
410 VDU 19,c,7;0;
420 VDU 19,c-1-5*(c=1),0;0;
430 I=INKEY(2)
440 VDU 19,c+5,5;0;
450 VDU 19,c+4-5*(c=1),0;0;
460 I=INKEY(2)
470 VDU 19,c+10,3;0;
480 VDU 19,c+9-5*(c=1),0;0;
490 I=INKEY(1)
500 c=c+1
510 IF c=6 c=1
520 UNTIL FALSE
530 ENDPROC
```

Listing 3.

```
10 REM >ArcRockets
20 REM by Norman Cadel
30 REM for Arc only
40 REM (c) BAU November 1989
50 :
60 MODE 13:OFF
70 dots=1000:maxact=3
80 DIM code 2000
90 record=32
100 init_act=3:scroff=3
110 init_x=4:plot_x=4
120 init_y=5:plot_y=5
130 init_dx=6
140 init_dy=7
150 init_col=8
160 :
170 count=9
180 addr=10
190 control=11
200 screen=12
210 sp=13
220 link=14
230 pc=15
240 FOR I%=0 TO 2 STEP 2:P%=code
250 [OPT I%
260 .go
270 STMFD (sp)!,{link}
280 ADR R0,_screen
290 MOV R1,#148
300 STR R1,[R0]
310 MOV R1,R0
320 SWI "OS_ReadVduVariables"
330 LDR screen,_screen
340 MOV R0,#1
350 STR R0,_active
360 MOV count,#dots
370 STR count,_free
380 ADR addr,data
390 MOV R0,#0
400 .cloop
410 STR R0,[addr],#4
420 STR R0,[addr],#4
430 STR R0,[addr],#4
440 STR R0,[addr],#4
450 STR R0,[addr],#4
460 STR R0,[addr],#4
470 STR R0,[addr],#4
480 STR R0,[addr],#4
490 SUBS count,count,#1
500 BNE cloop
510 BL rand
520 :
530 .mainloop
540 MOV R0,#19
550 SWI "OS_Byte"
560 SWI "OS_Byte"
570 BL rand
580 SWI "OS_ReadEscapeState"
590 BCC noescape
600 MOV R0,#126
610 SWI "OS_Byte"
620 LDMFD (sp)!,{pc}
630 .noescape
640 LDR R0,_active
650 CMP R0,#maxact+1
660 BEQ allactive
670 LDR R0,_free
680 CMP R0,#0
690 BEQ allactive
700 .xtoobig
710 BL rand
720 CMP R0,#320
730 BGE xtoobig
740 MOV init_x,R0
750 MOV init_y,#0
760 BL rand
770 AND R0,R0,#&FF
780 MOV init_dx,R0,ASL #3
790 CMP init_x,#160
800 RSBGT init_dx,init_dx,#0
810 BL rand
820 AND R0,R0,#&FF
830 MOV init_dy,R0,ASL #3
840 ADD init_dy,init_dy,R0,ASL #1
850 ADD init_dy,init_dy,#10*256
860 MVN init_act,#0
870 MOV init_col,#0
880 BL initdot
890 LDR R0,_active
900 ADD R0,R0,#1
910 STR R0,_active
920 .allactive
930 MOV control,#dots
940 ADR addr,data
950 .plotmove
960 LDR R1,[addr],#32
970 CMP R1,#0
980 BEQ nodot
990 LDR plot_x,[addr,#-12]
1000 LDR plot_y,[addr,#-8]
1010 MOV R0,#0
1020 BL plot
1030 LDR plot_x,[addr,#-28]
1040 LDR plot_y,[addr,#-24]
1050 CMP R1,#0
1060 MOVLT R0,#&FF
1070 BLT white
1080 LDR R0,[addr,#-4]
1090 ANDS R1,R0,#15
1100 BEQ getcol
1110 SUB R1,R0,#1
1120 STR R1,[addr,#-4]
1130 .getcol
1140 ADR R1,coltab
1150 LDR R0,[R1,R0]
1160 .white
1170 BL plot
1180 STR plot_x,[addr,#-12]
1190 STR plot_y,[addr,#-8]
1200 LDR R0,[addr,#-20]
1210 ADD plot_x,R0,plot_x,ASL #8
1220 MOV plot_x,plot_x,LSR #8
1230 STR plot_x,[addr,#-28]
1240 LDR R0,[addr,#-16]
1250 ADD plot_y,R0,plot_y,ASL #8
1260 MOV plot_y,plot_y,LSR #8
1270 STR plot_y,[addr,#-24]
1280 SUB R0,R0,#&100
1290 STR R0,[addr,#-16]
1300 LDR R1,[addr,#-32]
1310 CMP R1,#0
1320 BLT single
1330 SUBS R1,R1,#1
1340 BEQ dead
1350 STR R1,[addr,#-32]
1360 B nodot
1370 .single
1380 CMP R0,#0
1390 BGE nodot
1400 BL rand
1410 AND count,R0,#31
1420 ADD count,count,#16
1430 .makeexp
1440 LDR R0,_free
1450 CMP R0,#0
1460 BEQ die
1470 BL rand
1480 AND R0,R0,#&FF
1490 MOV init_dx,R0,ASL #2
1500 BL rand
1510 CMP R0,#256
1520 RSBGT init_dx,init_dx,#0
1530 BL rand
1540 AND R0,R0,#&FF
1550 MOV init_dy,R0,ASL #3
1560 ADD init_dy,init_dy,R0,ASL #1
1570 BL rand
1580 AND init_act,R0,#15
1590 ADD init_act,init_act,#10
1600 BL rand
1610 AND init_col,R0,#&F0
1620 ORR init_col,init_col,#&F
1630 BL initdot
1640 SUBS count,count,#1
1650 BNE makeexp
1660 .die
1670 LDR R0,_active
1680 SUB R0,R0,#1
1690 STR R0,_active
1700 .dead
1710 MOV R0,#0
1720 STR R0,[addr,#-32]
1730 LDR plot_x,[addr,#-12]
1740 LDR plot_y,[addr,#-8]
1750 MOV R0,#0
1760 BL plot
1770 LDR R0,_free
1780 ADD R0,R0,#1
1790 STR R0,_free
1800 .nodot
1810 SUBS control,control,#1
1820 BNE plotmove
1830 B mainloop
1840 :
1850 ._free
1860 EQUD dots
1870 ._active
1880 EQUD 0
1890 ._screen
1900 EQUD 148
1910 EQUD -1
1920 :
1930 .initdot
1940 STMFD (sp)!,{R0,R1,link}
1950 ADR R0,data
1960 .findfree
1970 LDR R2,[R0],#32
1980 CMP R2,#0
1990 BNE findfree
2000 STR init_act,[R0,#-32]
2010 STR init_x  ,[R0,#-28]
2020 STR init_y  ,[R0,#-24]
2030 STR init_dx ,[R0,#-20]
2040 STR init_dy ,[R0,#-16]
2050 STR init_dx ,[R0,#-12]
2060 STR init_dy ,[R0,#-8]
2070 STR init_col,[R0,#-4]
2080 LDR R0,_free
2090 SUB R0,R0,#1
2100 STR R0,_free
2110 LDMFD (sp)!,{R0,R1,pc}
2120 :
2130 .plot
2140 STMFD (sp)!,{R1,link}
2150 CMP plot_y,#254
2160 BGT noplot
2170 CMP plot_x,#316
2180 BGT noplot
2190 RSB R1,plot_y,#256
2200 MOV scroff,R1,ASL #6
2210 ADD scroff,scroff,R1,ASL #8
2220 ADD scroff,scroff,screen
2230 ADD scroff,scroff,plot_x
2240 STRB R0,[scroff]
2250 STRB R0,[scroff,#1]
2260 STRB R0,[scroff,#-1]
2270 STRB R0,[scroff,#-320]
2280 STRB R0,[scroff,#320]
2290 .noplot
2300 LDMFD (sp)!,{R1,pc}
2310 :
2320 .rand
2330 STMFD (sp)!,{R1,R2,R3,link}
2340 MOV R0,#0
2350 MOV R1,#9
2360 LDR R2,Aseed
2370 LDR R3,Axor
2380 .rand1
2390 MOVS R2,R2,LSL #1
2400 EORCS R2,R2,R3
2410 ADC R0,R0,R0
2420 SUBS R1,R1,#1
2430 BNE rand1
2440 STR R2,Aseed
2450 LDMFD (sp)!,{R1,R2,R3,pc}
2460 :
2470 .Aseed
2480 EQUD TIME
2490 .Axor
2500 EQUD &1D872B41
2510 :
2520 .coltab
2530 EQUD &00000000:EQUD &00000000
:EQUD &00000000:EQUD &00000000
2540 EQUD &06050400:EQUD &12111007
:EQUD &16151413:EQUD &17171717
2550 EQUD &22212000:EQUD &42414023
:EQUD &62616043:EQUD &63636363
2560 EQUD &26252400:EQUD &52515027
:EQUD &76757453:EQUD &77777777
2570 EQUD &0A090800:EQUD &8281800B
:EQUD &8A898883:EQUD &8B8B8B8B
2580 EQUD &0E0D0C00:EQUD &9291900F
:EQUD &9E9D9C93:EQUD &9F9F9F9F
2590 EQUD &2A292800:EQUD &C2C1C02B
:EQUD &EAE9E8C3:EQUD &EBEBEBEB
2600 EQUD &2E2D2C00:EQUD &D2D1D02F
:EQUD &FEFDFCD3:EQUD &FFFFFFFF
2610 EQUD &06050400:EQUD &32313007
:EQUD &56555433:EQUD &57575757
2620 EQUD &06050400:EQUD &1A191807
:EQUD &9695941B:EQUD &97979797
2630 EQUD &22212000:EQUD &46454423
:EQUD &72717047:EQUD &73737373
2640 EQUD &22212000:EQUD &4A494823
:EQUD &E2E1E04B:EQUD &E3E3E3E3
2650 EQUD &0A090800:EQUD &A2A1A00B
:EQUD &CAC9C8A3:EQUD &CBCBCBCB
2660 EQUD &0A090800:EQUD &8685840B
:EQUD &9A999887:EQUD &9B9B9B9B
2670 .data
2680 ]
2690 P%+=(dots+1)*4*8
2700 NEXT
2710 CALL go
```

Listing 4.

```
10 REM >Catherine Wheel
20 REM by Norman Cadel
30 REM for Arc only
40 REM (c) BAU November 1989
50 :
60 MODE 13
70 PRINT "Touch the light blue p
aper"
80 PRINT "and stand well back...
"
90 OFF
100 DIM code% &500
110 !code%=149
120 code%!4=-1
130 SYS "OS_ReadVduVariables",cod
e%,code%+8
140 screenbase%=code%!8
150 stars%=&400
160 seg%=2048
```

Continued ▶

DESIGN

◀ Continued

```
170 DIM sintab 4*seg%,costab 4*se
g%
180 DIM points 20*stars%
190 temp=0
200 addr=1
210 scr=2
220 ang=3
230 active=4
240 x=5
250 y=6
260 dx=7
270 dy=8
280 tbase=9
290 scaddr=10
300 starcount=11
310 base=12
320 sp=13
330 link=14
340 pc=15
350 FOR pass%=0 TO 2 STEP 2
360 P%=code%
370 [OPT pass%
380 .angle
390 EQUD 0
400 .done
410 EQUD 0
420 :
430 .whizz
440 STMFD (sp)!,{link}
450 STR R0,angle
460 MOV starcount,#stars%
470 LDR base,pointaddr
480 LDR scr,screenaddr
490 ADR scaddr,scale%
500 .whizzloop
510 LDMIA (base),{active,x,y,dx,d
y}
520 CMP active,#0
530 BGT exists
540 BEQ startit
550 ADD active,active,#1
560 B on
570 .startit
580 LDR temp,done
590 CMP temp,#0
600 BNE on
610 BL rand
620 MOV active,temp,ASL #1
630 LDR ang,angle
640 BL rand
650 ADD ang,ang,temp,ASL #15
660 MOV ang,ang,ASR #16
670 TST temp,#%1
680 ADDEQ ang,ang,#seg%/2
690 CMP ang,#seg%
700 SUBGE ang,ang,#seg%
710 BL rand
720 AND temp,temp,#63
730 ADD temp,temp,#&180
740 LDR tbase,sinaddr
750 LDR x,[tbase,ang,ASL #2]
760 MUL dx,x,temp
770 LDR tbase,cosaddr
780 LDR y,[tbase,ang,ASL #2]
790 MUL dy,y,temp
800 MOV dx,dx,ASR #8
810 MOV dy,dy,ASR #8
820 ADD ang,ang,#seg%/4
830 CMP ang,#seg%
840 SUBGE ang,ang,#seg%
850 LDR tbase,sinaddr
860 LDR x,[tbase,ang,ASL #2]
870 MOV x,x,ASL #3
880 ADD x,x,#160<<16
890 LDR tbase,cosaddr
900 LDR y,[tbase,ang,ASL #2]
910 MOV y,y,ASL #3
920 ADD y,y,#128<<16
930 B nowipe
940 .exists
950 ADD addr,scr,x,ASR #16
960 MOV temp,y,ASR #16
970 ADD addr,addr,temp,ASL #8
980 ADD addr,addr,temp,ASL #6
990 MOV temp,#0
1000 STRB temp,[addr]
1010 CMP active,#80*2
1020 BLT small
1030 STRB temp,[addr,#1]
1040 STRB temp,[addr,#320]
1050 STRB temp,[addr,#-1]
1060 STRB temp,[addr,#-320]
1070 CMP active,#200*2
1080 BLT small
1090 STRB temp,[addr,#-320-320]
1100 STRB temp,[addr,#-2]
1110 STRB temp,[addr,#320+320]
1120 STRB temp,[addr,#+2]
1130 .small
1140 ADD x,x,dx
1150 ADD y,y,dy
1160 ADD dy,dy,#&400
1170 .nowipe
1180 CMP x,#2<<16
1190 BLT off
1200 CMP x,#316<<16
1210 BGT off
1220 CMP y,#252<<16
1230 BLT notoff
1240 MOV y,#252<<16
1250 MOV dx,dx,ASR #1
1260 RSB dy,dy,#0~
1270 MOV dy,dy,ASR #2
1280 BNE notoff
1290 .off
1300 MOV active,#0
1310 B on
1320 .notoff
1330 SUBS active,active,#1*2
1340 BLE off
1350 ADD addr,scr,x,ASR #16
1360 MOV temp,y,ASR #16
1370 ADD addr,addr,temp,ASL #8
1380 ADD addr,addr,temp,ASL #6
1390 LDRB temp,[scaddr,active,ASR
#1]
1400 STRB temp,[addr]
1410 CMP active,#80*2
1420 BLT small2
1430 STRB temp,[addr,#1]
1440 STRB temp,[addr,#320]
1450 STRB temp,[addr,#-1]
1460 STRB temp,[addr,#-320]
1470 CMP active,#200*2
1480 BLT small2
1490 STRB temp,[addr,#-320-320]
1500 STRB temp,[addr,#-2]
1510 STRB temp,[addr,#320+320]
1520 STRB temp,[addr,#+2]
1530 .small2
1540 .on
1550 STMIA (base)!,{active,x,y,dx,
dy}
1560 SUBS starcount,starcount,#1
1570 BNE whizzloop
1580 LDMFD (sp)!,{pc}
1590 :
1600 .rand
1610 STMFD (sp)!,{R7,R8,R9,link}
1620 MOV R7,#8
1630 LDR R8,seed
1640 LDR R9,xor
1650 .randloop
1660 MOVS R8,R8,LSL #1
1670 EORCS R8,R8,R9
1680 SUBS R7,R7,#1
1690 BNE randloop
1700 STR R8,seed
1710 AND R0,R8,#255
1720 LDMFD (sp)!,{R7,R8,R9,pc}
1730 :
1740 .xor
1750 EQUD &1D872B41
1760 .seed
1770 EQUD TIME
1780 :
1790 .screenaddr
1800 EQUD screenbase%
1810 .sinaddr
1820 EQUD sintab
1830 .cosaddr
1840 EQUD costab
1850 .pointaddr
1860 EQUD points
1870 ]
1880 scale%=P%:P%+=256
1890 NEXT pass%
1900 FOR c%=0 TO 255
1910 k%=0
1920 b%=c%/&10
1930 IF b% AND 8 THEN k%+=%0100000
0
1940 IF b% AND 4 THEN k%+=%0010000
0
1950 IF b% AND 2 THEN k%+=%0000001
0
1960 IF b% AND 1 THEN k%+=%0000000
1
1970 c%?scale%=NOT k%
1980 NEXT
1990 FOR s%=0 TO seg%-1
2000 sintab!(4*s%)=&10000*SINRAD(s
%*360/seg%)
2010 costab!(4*s%)=&10000*COSRAD(s
%*360/seg%)
2020 NEXT
2030 FOR s%=0 TO stars%-1
2040 p%=points+20*s%
2050 !p%=-RND(1000)
2060 NEXT
2070 CLS
2080 A%=&100
2090 R%=0
2100 F%=2
2110 D%=0
2120 TIME=0
2130 REPEAT
2140 WAIT
2150 CALL whizz
2160 A%=(A%+R%+RND(256)) MOD (seg%
*&10000)
2170 IF R%<seg%*&1400 R%+=D%
2180 D%=R%/(seg%*8)+4*seg%
2190 UNTIL TIME>3000
2200 TIME=0
2210 REPEAT
2220 WAIT
2230 CALL whizz
2240 A%=(A%+R%+RND(256)) MOD (seg%
*&10000)
2250 IF R%>0 R%-=D%
2260 D%=R%/(seg%*8)+5*seg%
2270 UNTIL R%<0
2280 !done=-1
2290 TIME=0
2300 REPEAT
2310 WAIT
2320 CALL whizz
2330 UNTIL TIME>600
2340 CLS
```

See Put Up Job, page 75

Listing 1.

```
10 REM Poster
20 REM by Richard Abbotts
30 REM for B+/M/C
40 REM (c) BAU November 1989
50 :
60 ON ERROR GOTO 5200
70 MODE 135
80 B%=0:B$=""
90 *FX 4,1
100 DIM T$(15),H%(15),W%(15),F$(1
5),BH%(15),BW%(15),X%(15),Y%(15),BT
%(15),sp%(15)
110 DIM YL%(40),X1%(40),ln%(40),D
%(40),th%(40),DD%(4,4)
120 sptable=&C00:arw=&C80:os%=&C9
0:REM on MASTER use DIM sptable 128
,arw 10, os% 20
130 FOR T=1 TO 4:FOR D=1 TO 4:REA
D DD%(D,T):NEXT D,T
140 READ !arw,arw!4,arw!8:arrow$=
$arw+CHR$13
150 defF$="G.":defB$="B.":defP$="
P."
160 PROCord:started=FALSE:NB%=0
170 op$="#*:BbLlSsQqPpEeZz  CcNnR
rAaXxHhWwTtFfOo"+arrow$
180 CX%=320:CY%=512:bw%=0:pw%=640
:ph%=800
190 insp$=""
200 dummy=FNwidth("1","BBCFONT",1
)
210 REPEAT:MODE 132:PROCscreen:GC
OL 3,1
220 CB%=NB%-1:IF CB%>=0 THEN PROC
redraw
230 PROCcursor
240 REPEAT
250 finished =FALSE:printing=FALS
E:redrawing=FALSE:star=FALSE
260 PROCmenu
270 UNTIL finished OR printing OR
 redrawing OR star
280 IF NOT redrawing THEN MODE 13
5:HIMEM=&6400
290 IF star THEN PROCstar
300 IF printing THEN PROCprint
310 UNTIL finished
320 *FX 4
330 END
340 :
350 DEF PROCmenu
360 LOCAL G
370 PROChighlight(CB%):PROCw(1)
380 PRINT "B-egin new poster"'"L-
oad old poster"'"Q-uit   * command"
390 IF CB%=-1 THEN 420
400 PRINT"A-dd a box"'"R-emove
C-entre"'"X-pand    N-arrow"'"S-ave
 poster"'"H-eight   W-idth"'"T-ext
    F-ont"'"adjust si-Z-e"'"E-dging
  O=box"'"space=next box"
410 PRINT "P-rint"
420 PRINT "Border "B$" "STR$B%;
430 REPEAT
440 *FX 15,1
450 REPEAT:G=INSTR(op$,GET$) DIV
2:UNTIL G>0
460 IF G=13 AND started THEN PROC
newbox
470 IF CB%=-1 THEN 590
480 IF G=19 THEN PROCboxtype
490 IF G=18 THEN PROCfont
500 IF G=17 THEN PROCdraw(CB%):PR
OCnewtext(CB%):PROCdraw(CB%)
510 IF G=16 THEN PROCwidth:PROCd(
CB%)
520 IF G=15 THEN PROCheight:PROCd
(CB%)
530 IF G=12 THEN PROCdel:PROChigh
light(CB%)
540 IF G=10 THEN PROCcentre
550 IF G=14 THEN PROCwiden
560 IF G=11 THEN PROCnarrow
570 IF G>19 THEN PROCmvbx
580 IF G=9 AND NB%>0 THEN CB%=(CB
%+1) MOD NB%:PROChighlight(CB%)
590 UNTIL G<9
600 IF G=8 THEN PROCsize:redrawin
g=TRUE
610 IF G=7 THEN PROCedging:redraw
ing=TRUE
620 IF G=6 THEN printing=TRUE
630 IF G=5 THEN IF FNverify(" fin
ish     this program") THEN finishe
d=TRUE
640 IF G=4 THEN PROCsave
650 IF G=3 THEN PROCload
660 IF G=2 THEN PROCbegin
670 IF G=1 THEN star=TRUE
680 ENDPROC
690 :
700 DEF PROCmessage(M$,wait)
710 PROCw(2)
720 PRINT M$
730 IF wait THEN PRINT"PRESS SPAC
E ":REPEAT UNTIL GET=32:CLS
740 ENDPROC
750 :
760 DEF PROCcursor
770 MOVE CX%-8,CY%-8:DRAW CX%+8,C
Y%+8
780 MOVE CX%-8,CY%+8:DRAW CX%+8,C
Y%-8
790 ENDPROC
800 :
810 DEF PROCdraw(CB%)
820 IF CB%<0 THEN ENDPROC
830 MOVE X%(CB%),Y%(CB%):DRAW X%(
CB%),Y%(CB%)+BH%(CB%):DRAW X%(CB%)+
BW%(CB%),Y%(CB%)+BH%(CB%):DRAW X%(C
B%)+BW%(CB%),Y%(CB%):DRAW X%(CB%),Y
%(CB%)
840 ENDPROC
850 :
```

Continued ▶

◀ Continued

```
860 DEF PROCbegin
870 IF NOT started THEN 890
880 IF NOT FNverify(" begin a
new poster") THEN ENDPROC
890 NB%=0:started=TRUE:PROCord:PR
OCnewbox
900 redrawing=TRUE:B%=0:bw%=0
910 ENDPROC
920 :
930 DEF FNwidth(A$,F$,C)
940 LOCAL X%,Y%,A%
950 IF F$=insp$ THEN 1020
960 c=OPENIN(defF$+F$)
970 IF c=0 THEN PROCmessage("Chec
k disk has font "+F$,-1):c=OPENIN(d
efS$+F$)
980 IF c=0 THEN 1020
990 X%=os% MOD 256:Y%=os% DIV 256
:A%=4
1000 ?os%=c:os%!1=sptable:os%!5=12
8:os%!9=0:CALL&FFD1:CLOSE#c
1010 insp$=F$
1020 L=LEN(A$):ww=0
1030 FOR c=1 TO L:asc=ASC(MID$(A$,
c,1))
1040 IF asc<32 OR asc>123 THEN w=1
2 ELSE w=sptable?asc
1050 ww=ww+w
1060 NEXT c
1070 =C*ww/3
1080 :
1090 DEF PROCedging
1100 PROCw(2):CLS:PRINT"BORDER "'"
0 = no border"'"1 = thin"'"2 = thic
k"
1110 REPEAT:G=GET:UNTIL G>47 AND G
<51
1120 B%=G-48:bw%=B%*16:IFB%>0 PRIN
T'"Filename ":INPUTB$
1130 IF BB$<>"" THEN B$=BB$
1140 ENDPROC
1150 :
1160 DEF PROCscreen
1170 top%=1020-2*bw%
1180 bot%=1020+2*bw%-ph%
1190 left%=4+2*bw%
1200 rig%=4+pw%-2*bw%
1210 MOVE 0,0:DRAW 0,200:DRAW 1276
,200:DRAW 1276,0:DRAW 0,0
1220 MOVE pw%,1023:DRAWpw%,1023-ph
%:DRAW 0,1023-ph%:DRAW 0,1023:DRAW
pw%,1023
1230 MOVE 648,224:DRAW 648,512:DRA
W 1276,512:DRAW 1276,224:DRAW 648,2
24
1240 MOVE 648,524:DRAW 648,1023:DR
AW 1276,1023:DRAW 1276,524:DRAW 648
,524
1250 VDU 24,bw%;1023+bw%-ph%;pw%-b
w%;1023-bw%;
1260 GCOL 0,129:CLG
1270 ENDPROC
1280 :
1290 DEF PROCw(x)
1300 IF x=1 THEN VDU 28,21,15,38,1
1310 IF x=2 THEN VDU 28,21,23,38,1
7
1320 IF x=3 THEN VDU 28,1,30,38,26
1330 VDU 12
1340 ENDPROC
1350 :
1360 DEF PROCd(box)
1370 PROCw(3):PRINT"BOX ";CHR$(65+
box)
1380 IF T$(box)>"" PRINT T$(box)
1390 PROCw(2):IF T$(box)="" THEN 1
430
1400 PRINT"HEIGHT "H%(box)
1410 PRINT"WIDTH  "W%(box)
1420 PRINT"FONT  "F$(box)
1430 PRINT"BOX TYPE ";STR$(BT%(box
))
1440 ENDPROC
1450 :
1460 DEF PROCnewtext(b)
1470 PROCw(3)
1480 PRINT"TEXT FOR BOX ";CHR$(65+
b);" (RETURN for empty box)"
1490 INPUTLINE T$(b)
1500 X%(b)=CX%:Y%(b)=CY%
1510 IF T$(b)="" THEN PROCtoprt(b,
CX%,CY%):ENDPROC
1520 PROCd(b):INPUT "FONT NAME "F$
1530 IF F$>"" THEN F$(b)=F$
1540 PROCnewwidth(b)
1550 BH%(b)=H%(b)*16
1560 ENDPROC
1570 :
1580 DEF PROCsave
1590 PROCw(1)
1600 PRINT "SAVE THIS POSTER"
1610 INPUT "FILENAME"PF$
1620 IF PF$="" THEN ENDPROC
1630 X=OPENIN(defP$+PF$):CLOSE#X
1640 IF X=0 THEN 1660
1650 IF NOT FNverify(" overwrite a
file of that    name")THEN ENDPROC
1660 X=OPENOUT(defP$+PF$)
1670 PRINT#X,NB%
1680 FOR B=0 TO NB%-1
1690 PRINT#X,T$(B),F$(B),X%(B),Y%(
B),BH%(B),BW%(B),sp%(B),H%(B),W%(B)
,BT%(B)
1700 NEXT B
1710 PRINT#X,bw%,B%,pw%,ph%,B$
1720 CLOSE#X
1730 ENDPROC
1740 :
1750 DEF PROCload
1760 PROCw(1)
1770 PRINT"LOAD A POSTER"'"Filenam
e ?"
1780 INPUT PF$
1790 IF PF$="" THEN ENDPROC
1800 IF NOT started THEN 1820
1810 IF NOT FNverify(" load
another poster? ") THEN ENDPROC
1820 X=OPENIN(defP$+PF$)
1830 IF X=0 THEN PROCmessage("NO S
UCH POSTER",-1):ENDPROC
1840 PROCord
1850 INPUT#X,NB%
1860 FOR B=0 TO NB%-1
1870 INPUT#X,T$(B),F$(B),X%(B),Y%(
B),BH%(B),BW%(B),sp%(B),H%(B),W%(B)
,BT%(B)
1880 NEXT B
1890 INPUT#X,bw%,B%,pw%,ph%,B$
1900 redrawing=TRUE
1910 started=TRUE
1920 CLOSE#X
1930 ENDPROC
1940 :
1950 DEF PROCredraw
1960 FOR B=0 TO NB%-1:PROCdraw(B):
NEXT B
1970 ENDPROC
1980 :
1990 DEF PROCnewbox
2000 PROCw(2)
2010 PRINT"Move cursor then"'"    p
ress RETURN"
2020 PROCmvcsr
2030 CLS
2040 PROCnewtext(NB%)
2050 CB%=NB%:NB%=NB%+1
2060 PROCdraw(CB%)
2070 ENDPROC
2080 :
2090 DEF PROCtoprt(box%,cx%,cy%)
2100 PROCw(2):PRINT"Move cursor to
 top rh side of box"
2110 PROCcursor
2120 REPEAT:PROCmvcsr:UNTIL CY%>cy
% AND CX%>cx%:PROCcursor
2130 BH%(box%)=CY%-cy%
2140 sp%(box%)=CX%-cx%:BW%(box%)=s
p%(box%)
2150 X%(box%)=cx%
2160 Y%(box%)=cy%
2170 CX%=cx%:CY%=cy%
2180 PROCw(2)
2190 ENDPROC
2200 :
2210 DEF PROCmvcsr
2220 LOCAL G
2230 REPEAT
2240 *FX 15,1
2250 REPEAT
2260 G=INSTR(arrow$,GET$)
2270 UNTIL G>0
2280 PROCcursor
2290 IF INKEY(-1) THEN V%=32 ELSE
V%=8
2300 IF G=1 AND CX%+V%<rig% THEN C
X%=CX%+V%
2310 IF G=3 AND CX%>V%+left% THEN
CX%=CX%-V%
2320 IF G=5 AND CY%+V%<top% THEN C
Y%=CY%+V%
2330 IF G=7 AND CY%>V%+bot% THEN C
Y%=CY%-V%
2340 PROCcursor
2350 UNTIL G=9
2360 ENDPROC
2370 :
2380 DEF PROChighlight(b)
2390 IF b=-1 THEN ENDPROC
2400 PROCd(b)
2410 PROCcursor
2420 CX%=X%(CB%):CY%=Y%(CB%)
2430 PROCcursor
2440 ENDPROC
2450 :
2460 DEF PROCmvbx
2470 IF CB%=-1 THEN ENDPROC
2480 IF INKEY(-1) THEN V%=32 ELSE
V%=8
2490 PROCcursor:PROCdraw(CB%)
2500 IF G=20 AND CX%+BW%(CB%)+V%<r
ig% THEN CX%=CX%+V%:X%(CB%)=CX%
2510 IF G=21 AND CX%>V%+left% THEN
 CX%=CX%-V%:X%(CB%)=CX%
2520 IF G=22 AND CY%+BH%(CB%)+V%<t
op% THEN CY%=CY%+V%:Y%(CB%)=CY%
2530 IF G=23 AND CY%>bot%+V% THEN
CY%=CY%-V%:Y%(CB%)=CY%
2540 PROCdraw(CB%):PROCcursor
2550 ENDPROC
2560 :
2570 DEF PROCcentre
2580 PROCdraw(CB%):PROCcursor
2590 CX%=(4+pw%-BW%(CB%))/2:X%(CB%
)=CX%
2600 PROCdraw(CB%):PROCcursor
2610 ENDPROC
2620 :
2630 DEF PROCwiden
2640 PROCdraw(CB%)
2650 IF CX%+BW%(CB%)+8<rig% THEN B
W%(CB%)=BW%(CB%)+8:sp%(CB%)=sp%(CB%
)+8
2660 PROCdraw(CB%)
2670 ENDPROC
2680 :
2690 DEF PROCnarrow
2700 PROCdraw(CB%)
2710 IF sp%(CB%)>=8 THEN sp%(CB%)=
sp%(CB%)-8:BW%(CB%)=BW%(CB%)-8
2720 PROCdraw(CB%)
2730 ENDPROC
2740 :
2750 DEF PROCfont
2760 IF T$(CB%)="" THEN PROCmessag
e("No text ",-1):ENDPROC
2770 PROCw(2)
2780 INPUT"Font name "F$(CB%)
2790 PROCdraw(CB%)
2800 PROCnewwidth(CB%)
2810 PROCdraw(CB%)
2820 ENDPROC
2830 :
2840 DEF PROCwidth
2850 IF T$(CB%)="" THEN PROCmessag
e("No text ",-1):ENDPROC
2860 PROCw(2)
2870 REPEAT:INPUT"NEW WIDTH 1-20 "
WW:UNTIL WW>=1
2880 PROCdraw(CB%)
2890 BW%(CB%)=(BW%(CB%)-sp%(CB%))*
WW/W%(CB%)+sp%(CB%)
2900 W%(CB%)=WW
2910 PROCdraw(CB%)
2920 ENDPROC
2930 :
2940 DEF PROCheight
2950 IF T$(CB%)="" THEN PROCmessag
e("No text ",-1):ENDPROC
2960 PROCw(2)
2970 PROCdraw(CB%)
2980 REPEAT:INPUT"NEW HEIGHT 1-20
"H%(CB%):UNTIL H%(CB%)>0
2990 BH%(CB%)=H%(CB%)*16
3000 PROCdraw(CB%)
3010 ENDPROC
3020 :
3030 DEF PROCdel
3040 IF NOT FNverify(" remove
this box") THEN ENDPROC
3050 PROCdraw(CB%)
3060 NB%=NB%-1:IF CB%=NB% THEN CB%
=NB%-1:ENDPROC
3070 FOR b%=CB%+1 TO NB%:T$(b%-1)=
T$(b%):H%(b%-1)=H%(b%):W%(b%-1)=W%(
b%):F$(b%-1)=F$(b%):BH%(b%-1)=BH%(b
%):BW%(b%-1)=BW%(b%):X%(b%-1)=X%(b%
):Y%(b%-1)=Y%(b%):BT%(b%-1)=BT%(b%)
:sp%(b%-1)=sp%(b%):NEXT b%
3080 ENDPROC
3090 :
3100 DEF PROCboxtype
3110 PROCd(CB%)
3120 PRINT"NEW BOX TYPE 0-6 "
3130 REPEAT:K=GET-48:UNTIL K>-1 AN
D K<7
3140 BT%(CB%)=K:PROCd(CB%)
3150 ENDPROC
3160 :
3170 DEF PROCstar
3180 INPUTLINE"*"s$
3190 OSCLI(s$)
3200 PRINT''"PRESS SPACE":REPEAT U
NTIL GET=32
3210 ENDPROC
3220 :
3230 DEF PROCsize
3240 rmin%=127:hmin%=127:IF NB%=0
THEN 3290
3250 FOR box%=0 TO NB%-1
3260 IF 1024-Y%(box%)>hmin% THEN h
min%=1024-Y%(box%)
3270 IF X%(box%)+BW%(box%)>rmin% T
HEN rmin%=X%(box%)+BW%(box%)
3280 NEXT box%
3290 VDU 24,4;220;632;1020;
3300 LOCAL G
3310 PROCcursor
3320 PROCw(2):PRINT"USE CURSOR KEY
S"
3330 REPEAT
3340 MOVE 0,1020-ph%:DRAW pw%,1020
-ph%:DRAW pw%,1020
3350 *FX 15,1
3360 REPEAT:G=INSTR(arrow$,GET$)
3370 UNTIL G>0
3380 MOVE 0,1020-ph%:DRAW pw%,1020
-ph%:DRAW pw%,1020
3390 IF G=1 AND pw%<597 THEN pw%=p
w%+32
3400 IF G=3 AND pw%>rmin%+32 THEN
pw%=pw%-32
3410 IF G=5 AND ph%>hmin%+32 THEN
ph%=ph%-32
3420 IF G=7 AND ph%<769 THEN ph%=p
h%+32
3430 UNTIL G=9
3440 bot%=1020+bw%-ph%
3450 rig%=4+pw%-bw%
3460 CY%=1024-ph%/2:CX%=pw%/2
3470 ENDPROC
3480 :
3490 DEF PROCnewwidth(box)
3500 sp%(box)=W%(box)*(LENT$(box)-
1)
3510 BW%(box)=FNwidth(T$(box),F$(b
ox),W%(box))+sp%(box)
3520 xsp%=8-(BW%(box) MOD 8)
3530 BW%(box)=BW%(box)+xsp%
3540 sp%(box)=sp%(box)+xsp%
3550 ENDPROC
3560 :
3570 DEF PROCord
3580 FOR F=0 TO 15:F$(F)="BBCFONT"
:H%(F)=1:W%(F)=3:NEXT
3590 ENDPROC
3600 :
3610 DEF PROCprint
3620 *LOAD MC 7900
3630 infont$=""
3640 pbuffer=&70
3650 fonttop=&72
3660 fontbottom=&74
3670 sp=&76
3680 PROCcheck:IF rpt>0 THEN ENDPR
OC
3690 IF B%>0 THEN OSCLI("LOAD "+de
fB$+B$+" 7B00")
3700 max%=3*pw%
3710 PROCareas:PROCposter:ENDPROC
3720 :
3730 DEF PROCareas
3740 NL%=0:IF NB%=0 THEN ENDPROC
3750 FOR B=0 TO NB%-1:IF BT%(B)=0
THEN 3850
3760 IF BT%(B)<4 THEN NL%=NL%+1:YL
%(NL%)=Y%(B)-4:X1%(NL%)=X%(B)-4:th%
(NL%)=BH%(B)+8:ln%(NL%)=BW%(B)+8:D%
(NL%)=BT%(B):GOTO 3850
3770 IF BT%(B)=5 THEN NL%=NL%+1:YL
%(NL%)=Y%(B)-(2*H%(B)):X1%(NL%)=X%(
B)-(2*H%(B)):th%(NL%)=2*H%(B):ln%(N
L%)=BW%(B)+(4*H%(B)):D%(NL%)=4:GOTO
 3850
3780 NL%=NL%+1:YL%(NL%)=Y%(B)-4:X1
%(NL%)=X%(B)-4:th%(NL%)=BH%(B)+8:ln
%(NL%)=2:D%(NL%)=4
```

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```
3790 NL%=NL%+1:YL%(NL%)=Y%(B)-4:X1%(NL%)=X%(B)+BW%(B):th%(NL%)=BH%(B)+8:ln%(NL%)=2:D%(NL%)=4
3800 NL%=NL%+1:YL%(NL%)=Y%(B)+BH%(B)+2:X1%(NL%)=X%(B)-2:th%(NL%)=2:ln%(NL%)=BW%(B)+2:D%(NL%)=4
3810 NL%=NL%+1:YL%(NL%)=Y%(B)-4:X1%(NL%)=X%(B)-2:th%(NL%)=2:ln%(NL%)=BW%(B)+2:D%(NL%)=4
3820 IF BT%(B)<>6 THEN 3850
3830 NL%=NL%+1:YL%(NL%)=Y%(B)-6-BH%(B)/16:X1%(NL%)=X%(B)+4:th%(NL%)=2+BH%(B)/16:ln%(NL%)=BW%(B)-1:D%(NL%)=4
3840 NL%=NL%+1:YL%(NL%)=Y%(B)-6-BH%(B)/16:X1%(NL%)=X%(B)+BW%(B)+2:th%(NL%)=BH%(B)+8:ln%(NL%)=8:D%(NL%)=4
3850 NEXT B
3860 ENDPROC
3870 :
3880 DEF PROCposter
3890 !&7911=&7000
3900 density=&7915
3910 VDU 2
3920 FOR y=1016 TO 1024-ph% STEP -8
3930 xmax=0
3940 CALL &7A41
3950 IF NB%=0 THEN 3990
3960 FOR B=0 TO NB%-1
3970 IF y>Y%(B)-7 AND y<=(Y%(B)+BH%(B)-8) THEN PROCfill
3980 NEXT B
3990 IF NL%=0 THEN GOTO 4030
4000 FOR L=1 TO NL%
4010 IF YL%(L)+th%(L)>y AND YL%(L)<=y+7 THEN PROCline
4020 NEXT L
4030 PROCborder
4040 IF xmax>max% THEN xmax=max%
4050 !&790D=xmax
4060 CALL &79BF
4070 NEXT y
4080 VDU 1,27,1,64,13,13,3
4090 ENDPROC
4100 :
4110 DEF PROCfill
4120 IF T$(B)<>"" AND infont$<>F$(B) THEN OSCLI("LOAD "+defF$+F$(B)+" 6400"):infont$=F$(B)
4130 bsf=Y%(B)+BH%(B)-8-y
4140 psf=bsf DIV H%(B)
4150 hsf=bsf MOD H%(B)
4160 ?&7905=psf
4170 ?&7907=hsf
4180 ?&7901=H%(B)
4190 ?&7902=W%(B)
4200 IF X%(B)<0 THEN X%(B)=0
4210 !&70=&7000+3*X%(B)
4220 L=LEN(T$(B)):l%=L-1:IF l%<1 THEN l%=1
4230 IF L=0 THEN 4350
4240 FOR c=1 TO L:a=ASC(MID$(T$(B),c,1))-32
4250 !&72=&6480+a*16
4260 !&74=&6A40+a*16
4270 ?&7908=a?&6420
4280 IF ?&7908=0 THEN ?&7908=1
4290 IF l%=1 THEN spaces=sp%(B)*3:GOTO 4310
4300 spaces=(3*sp%(B)) DIV l%:IF c < (3*sp%(B) MOD l%) THEN spaces=spaces+1
4310 ?&76=spaces
4320 CALL &7933
4330 NEXT c
4340 IF 3*(X%(B)+BW%(B))>xmax THEN xmax=3*(X%(B)+BW%(B))
4350 ENDPROC
4360 :
4370 DEF PROCline
4380 IF y>=YL%(L) THEN lm=0 ELSE lm=YL%(L)-y
4390 hm=YL%(L)+th%(L)-y:IF hm>7 THEN hm=7
4400 ?&7925=(hm?&7927)-(lm?&7926)
4410 !density=DD%(1,D%(L)):density!4=DD%(2,D%(L)):density!8=DD%(3,D%(L)):density!12=DD%(4,D%(L))
4420 !&792F=ln%(L)*3
4430 !&70=&7000+X1%(L)*3
4440 IF 3*(X1%(L)+ln%(L))>xmax THEN xmax=3*(X1%(L)+ln%(L))
4450 CALL &7A5E
4460 ENDPROC
4470 :
4480 REM - DATA FOR SHADING PATTERNS
4490 DATA &88,&44,&22,&11
4500 DATA &80000200,&10000400,&20000800,&40000100
4510 DATA &80000000,0,&8000000,0
4520 DATA &FFFFFFFF,&FFFFFFFF,&FFFFFFFF,&FFFFFFFF
4530 :
4540 DATA &88888989,&8A8A8B8B,13
4550 :
4560 DEF PROCborder
4570 IF B%<1 OR B%>2 THEN ENDPROC ELSE mid%=pw% DIV bw% -2
4580 IF y<(1017-bw%) AND y>(1023+bw%-ph%) THEN PROCleft:PROCright
4590 IF y>(1023-bw%) THEN t$="1"+STRING$(mid%,"2")+"3":PROCtop
4600 IF y<(1024+bw%-ph%) THEN t$="6"+STRING$(mid%,"7")+"8":PROCtop
4610 ENDPROC
4620 :
4630 DEF PROCleft
4640 PROCsetup
4650 !&72=&7B00+3*16:!&74=&7B80+3*16:?&7908=16:?&76=0
4660 CALL &7933
4670 ENDPROC
4680 :
4690 DEF PROCright
4700 PROCsetup
4710 !&70=&7000+max%-3*bw%
4720  xmax=max%
4730 !&72=&7B00+4*16:!&74=&7B80+4*16:?&7908=16:?&76=0
4740 CALL &7933
4750 ENDPROC
4760 :
4770 DEF PROCsetup
4780 bsf=(1016-y) MOD (B%*16):psf=bsf DIV B%:hsf=bsf MOD B%
4790 ?&7905=psf:?&7907=hsf:?&7901=B%:?&7902=3*B%
4800 !&70=&7000
4810 ENDPROC
4820 :
4830 DEF PROCtop
4840 PROCsetup
4850 FOR c=1 TO LENt$:a=VAL(MID$(t$,c,1))-1
4860 !&72=&7B00+a*16
4870 !&74=&7B80+a*16
4880 ?&7908=16
4890 ?&76=0
4900 xmax=max%
4910 CALL &7933
4920 NEXT c
4930 ENDPROC
4940 :
4950 DEF FNverify(M$)
4960 LOCAL G
4970 PROCw(2)
4980 PRINT"Are you sure you"'"want to";M$
4990 REPEAT:G=GET AND &5F:UNTIL G=89 OR G=ASC"N"
5000 =G=89
5010 :
5020 DEF PROCcheck
5030 PRINT''"PREPARING TO PRINT"'"Please check printer if necessary"''
5040 rpt=0
5050 IF B%=0 THEN 5070
5060 X=OPENIN(defB$+B$):IF X=0 THEN PROCreport(B$,-1) ELSE CLOSE#X:OSCLI("LOAD "+defB$+B$+" 7B00")
5070 FOR box=0 TO NB%-1
5080 IF T$(box)=""THEN 5100
5090 X=OPENIN(defF$+F$(box)):IF X=0 THEN PROCreport(F$(box),box) ELSE CLOSE#X
5100 NEXT box
5110 PROCmessage("",-1)
5120 ENDPROC
5130 :
5140 DEF PROCreport(X$,Z)
5150 IF rpt=0 THEN PRINT"The poster cannot be printed without"'
5160 PRINTX$;:IF Z>=0 THEN PRINT" for box "CHR$(65+Z)
5170 rpt=rpt+1
5180 ENDPROC
5190 :
5200 REM error handling
5210 VDU 1,27,1,64,1,12,3
5220 MODE 7:HIMEM=&5700
5230 REPORT
5240 PRINT" at line "ERL
5250 PRINT"Continue (Y/N?) "
5260 REPEAT:G=INSTR("YyNn",GET$):UNTIL G>0
5270 IF G<3 THEN 200 ELSE 320
```

Listing 2.

```
10 REM POSTER MC
20 REM by Richard Abbotts
30 REM for B+,M,C
40 REM (c) BAU November 1989
50 :
60 MODE 7
70 version=6
80 HIMEM=&7900
90 oswrch=&FFEE
100 pbuffer=&70
110 fonttop=&72
120 fontbottom=&74
130 sp=&76
140 :
150 FOR pass=0 TO 2 STEP 2
160 P%=&7900
170 [OPT pass
180 .buffer EQUB version
190 .height EQUB 1
200 .width EQUB 1
210 .lobyte EQUB 0
220 .hibyte EQUB 0
230 .pixelssofar EQUB 0
240 .bit EQUB 0
250 .heightsofar EQUB 0
260 .cwidth EQUB 0
270 .remain EQUD 0
280 .remainbu EQUD 0
290 .pbufferbu EQUD 0
300 .density EQUD 0
310 EQUD 0
320 EQUD 0
330 EQUD 0
340 .fmask EQUB 0
350 .mask EQUB 0
360 EQUD &F070301
370 EQUD &FF7F3F1F
380 .length EQUD 0
390 :
400 .onechar LDY#0
410 .vert LDA (fonttop),Y
420 STA hibyte
430 LDA (fontbottom),Y
440 STA lobyte
450 TYA
460 PHA
470 JSR onebyte
480 LDX width
490 LDY #0
500 .wloop STA (pbuffer),Y
510 INC pbuffer
520 BNE carry
530 INC pbuffer+1
540 .carry DEX
550 BNE wloop
560 PLA
570 TAY
580 INY
590 CPY cwidth
600 BNE vert
610 LDA#0
620 LDY sp
630 BNE sloop
640 RTS
650 .sloop STA (pbuffer),Y
660 DEY
670 BNE sloop
680 CLC
690 LDA sp
700 ADC pbuffer
710 STA pbuffer
720 LDA#0
730 ADC pbuffer+1
740 STA pbuffer+1
750 RTS
760 :
770 .onebyte LDA #0
780 STA buffer
790 LDX heightsofar
800 LDY pixelssofar
810 CPY#0
820 BEQ transfer
830 .back JSR rotate
840 DEY
850 BNE back
860 .transfer LDY #8
870 .nextpixel JSR rotate
880 LDA#0
890 ADC#0
900 STA bit
910 .cont LDA bit
920 JSR doabit
930 INX
940 CPX height
950 BEQ doneapixel
960 .check DEY
970 BNE cont
980 RTS
990 :
1000 .rotate CLC
1010 ROL lobyte
1020 ROL hibyte
1030 RTS
1040 .doneapixel LDX#0
1050 DEY
1060 BNE nextpixel
1070 RTS
1080  :
1090 .doabit ASL buffer
1100 ADC buffer
1110 STA buffer
1120 RTS
1130 .pline JSR sets1
1140 JSR print
1150 JSR crlf
1160 JSR print
1170 JSR sets33
1180 JMP crlf
1190 .byte PHA
1200 LDA #1
1210 JSR oswrch
1220 PLA
1230 JMP oswrch
1240 :
1250 .print LDA remainbu
1260 STA remain
1270 LDA remainbu+1
1280 STA remain+1
1290 LDA pbufferbu
1300 STA pbuffer
1310 LDA pbufferbu+1
1320 STA pbuffer+1
1330 JSR graphics
1340 LDY#0
1350 .ploop LDA (pbuffer),Y
1360 JSR byte
1370 INC pbuffer
1380 BNE noc
1390 INC pbuffer+1
1400 .noc DEC remain
1410 BNE ploop
1420 DEC remain+1
1430 BPL ploop
1440 RTS
1450 :
1460 .esc PHA
1470 LDA#27
1480 JSR byte
1490 PLA
1500 JMP byte
1510 :
1520 .graphics LDA#90
1530 JSR esc
1540 LDA remain
1550 JSR byte
1560 LDA remain+1
1570 JMP byte
1580 :
1590 .sets1 LDA #51
1600 JSR esc
1610 LDA #1
1620 JMP byte
1630 :
1640 .sets33 LDA #51
1650 JSR esc
1660 LDA #22
1670 JMP byte
1680 :
1690 .crlf
1700 LDA #13
1710 JMP byte
1720 RTS
1730 :
1740 .clear LDA pbufferbu
1750 STA pbuffer
1760 LDA pbufferbu+1
1770 STA pbuffer+1
1780 LDA#0
1790 TAY
1800 LDX#7
1810 .aloop JSR cloop
1820 INC pbuffer+1
1830 DEX
```

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```
1840 BNE aloop
1850 .cloop STA (pbuffer),Y
1860 INY
1870 BNE cloop
1880 RTS
1890 :
1900 .line LDA length
1910 BEQ lok
1920 INC length+1
1930 .lok LDX#15
1940 .dloop LDA density,X
1950 AND fmask
1960 STA density,X
1970 DEX
1980 BPL dloop
1990 INX
2000 LDY#0
2010 .eloop LDA (pbuffer),Y
2020 ORA density,X
2030 STA (pbuffer),Y
2040 INX
2050 CPX#16
2060 BNE xok
2070 LDX#0
2080 .xok INC pbuffer
2090 BNE pbok
2100 INC pbuffer+1
2110 .pbok DEC length
2120 BNE eloop
2130 DEC length+1
2140 BNE eloop
2150 RTS
2160 ]
2170 NEXT pass
2180 CLS
2190 PRINT'"Press SPACE to save code."
2200 REPEAT UNTIL GET=32
2210 *SAVE MC 7900 +1A0
```

Listing 3.

```
  10 REM BBC Fonts
  20 REM by Richard Abbotts
  30 REM for B+/M/C
  40 REM (c) BAU November 1989
  50 :
  60 MODE 7
  70 HIMEM=&4800
  80 space=&4800
  90 old=&70:new=&72
 100 DIM D%(16),F$(4)
 110 asc%=&70:chr%=&71:osword=&FFF1
 120 oldfont=&5800:newfont=&4880
 130 PROCassemble
 140 FOR font=1 TO 4
 150 READ F$(font)
 160 PROCbbc
 170 FOR A=0 TO &C00 STEP 4:A!&4800=0:NEXT A
 180 PROCconvert
 190 NEXT font
 200 VDU26,12
 210 :
 220 END
 230 :
 240 DEFP ROCassemble
 250 FOR pass=0 TO 2 STEP 2
 260 P%=&6800
 270 [OPT pass
 280 .arrange LDY#0
 290 .mloop LDX#7
 300 STY byte
 310 .loop LDY offset,X
 320 LDA(old),Y
 330 LDY byte
 340 AND bitmask,Y
 350 BEQ skip
 360 LDA bitmask,X
 370 .skip ORA(new),Y
 380 STA (new),Y
 390 DEX:BPL loop
 400 INY:CPY #8:BNE mloop
 410 RTS
 420 .offset EQUB 0
 430 EQUB 2
 440 EQUB 4
 450 EQUB 6
 460 EQUB 8
 470 EQUB 10
 480 EQUB 12
 490 EQUB 14
 500 .bitmask EQUB 128
 510 EQUB 64
 520 EQUB 32
 530 EQUB 16
 540 EQUB 8
 550 EQUB 4
 560 EQUB 2
 570 EQUB 1
 580 .byte EQUB 0
 590 ]
 600 NEXT pass
 610 ENDPROC
 620 :
 630 DEF PROCconvert
 640 VDU 26,12:PRINT"CHAR      WIDTH"'
 650 VDU 28,0,23,39,1
 660 FOR c=0 TO 90
 670 PROCchar(c*32+oldfont,((c+1)*16)+newfont)
 680 PROCprop(c)
 690 VDU c+33,32,32:PRINTw
 700 NEXT c
 710 PROCspacechar
 720 D$="BBC FONT - "+F$(font)
 730 IF LEND$>30 THEN D$=LEFT$(D$,30)
 740 $space=D$
 750 PRINT"INSERT DESTINATION DISK AND PRESS THE SPACE BAR" :REPEAT UNTIL GET=32
 760 OSCLI("SAVE G."+F$(font)+" 4800 +C00")
 770 ENDPROC
 780 :
 790 DEF PROCchar(A,B)
 800 PROCarrange(A,B)
 810 PROCarrange(A+1,B+8)
 820 PROCarrange(A+16,B+&5C0)
 830 PROCarrange(A+17,B+&5C8)
 840 ENDPROC
 850 :
 860 DEF PROCarrange(oldstart,newstart)
 870 ?new=newstart MOD 256
 880 new?1=newstart DIV 256
 890 ?old=oldstart MOD 256
 900 old?1=oldstart DIV 256
 910 CALL arrange
 920 ENDPROC
 930 :
 940 DEF PROCprop(c)
 950 top=newfont+(c+1)*16
 960 bottom=top+&5C0
 970 A=-1
 980 REPEAT:A=A+1
 990 UNTIL A?top>0 OR A?bottom>0 OR A=12
1000 B=16
1010 REPEAT:B=B-1
1020 UNTIL B?top>0 OR B?bottom>0 OR B=A
1030 FOR bytes=0 TO B-A
1040 bytes?top=top?(bytes+A)
1050 bytes?bottom=bottom?(bytes+A)
1060 NEXT bytes
1070 w=2+B-A
1080 IF w>16 THEN w=16
1090 space?(c+33)=w
1100 IF (B-A)>14 THEN ENDPROC
1110 FOR bytes=B+1-A TO 15
1120 bytes?top=0
1130 bytes?bottom=0
1140 NEXT bytes
1150 ENDPROC
1160 :
1170 DEF PROCspacechar
1180 FOR byte=0 TO 15:byte?newfont=0:byte?(newfont+&5C0)=0:NEXT byte
1190 space?32=12
1200 ENDPROC
1210 :
1220 DEF PROCbbc
1230 PRINT"READING BBC CHARS FROM MEMORY"
1240 FOR c=33 TO 123:VDUc
1250 A%=10:X%=asc%:Y%=0:?asc%=c:CALL osword
1260 FOR line=0 TO 7
1270 D%(line)=chr%?(7-line)
1280 NEXT line
1290 FOR line=15 TO 0 STEP -1
1300 D%(line)=D%(line DIV 2)
1310 IF font=2 THEN D%(line)=D%(line) AND (D%(line) DIV 2)
1320 IF font=3 THEN D%(line)=D%(line) OR (D%(line) DIV 2)
1330 IF font=4 THEN D%(line)=D%(line)*2^((15-line) DIV 3)
1340 oldfont?((c-33)*32+30-2*line)=D%(line) DIV 256
1350 oldfont?((c-33)*32+31-2*line)=D%(line) MOD 256
1360 NEXT line
1370 NEXT c
1380 ENDPROC
1390 :
1400 DATA BBCFONT,BBCTHIN,BBCFAT,BBCLEAN
```

Listing 4.

```
  10 REM Border Generator
  20 REM by Richard Abbotts
  30 REM for B+/M/C
  40 REM (c) BAU November 1989
  50 :
  60 MODE 7
  70 PRINT''"           BORDER GENERATOR"
  80 HIMEM=&7B00
  90 FOR border=1 TO 3
 100 READ B$
 110 FOR A%=&7B00 TO &7BFC STEP 4
 120 READ !A%
 130 NEXT A%
 140 PRINT''"Insert disc and press SPACE to save border '";B$;"'."
 150 REPEAT UNTIL GET=32
 160 OSCLI("SAVE "+B$+" 7B00 +100")
 170 NEXT border
 180 PRINT''"F I N I S H E D"
 190 END
 200 DATA "B.FRILLS"
 210 DATA &9E8080FF,&809E9292,&9F909F80,&2FE8080
 220 DATA &8080FE02,&9293909F,&92929292,&2F29292
 230 DATA &8080FE02,&809F909F,&92929E80,&FF80809E
 240 DATA &4E40407F,&ACA4A4A,&4848CB0A,&7F40404F
 250 DATA &4F40407F,&ACB4848,&4A4ACA0A,&7F40404E
 260 DATA &4E40407F,&ACA4A4A,&4F48CB0A,&27E4040
 270 DATA &8080FE02,&809F909F,&92929E80,&2F29292
 280 DATA &40407E02,&ACB484F,&4A4ACA0A,&7F40404E
 290 DATA &720202FE,&50535252,&F212D350,&407E0202
 300 DATA &1017F40,&1F909F9,&49497901,&404F4949
 310 DATA &2027E40,&50D312F2,&52525350,&FE020272
 320 DATA &7E0202FE,&7F4040,&FF00,&FE0202FE
 330 DATA &FE0202FE,&FF0000,&40407F00,&FE02027E
 340 DATA &790101FF,&1794949,&F909F901,&407F0101
 350 DATA &1017F40,&49C909F9,&49494949,&404F4949
 360 DATA &1017F40,&1F909F9,&49497901,&FF010179
 370 :
 380 DATA "B.PLAIN"
 390 DATA &808080FF,&8F8F8F8F,&8F8F8F8F,&8F8F8F8F
 400 DATA &8F8F8F8F,&8F8F8F8F,&8F8F8F8F,&8F8F8F8F
 410 DATA &8F8F8F8F,&8F8F8F8F,&8F8F8F8F,&FF808080
 420 DATA &FF,&FFFFFFFF,0,0
 430 DATA 0,0,&FFFFFFFF,&FF000000
 440 DATA &FF,&FFFFFFFF,0,0
 450 DATA 0,0,0,0
 460 DATA 0,0,&FFFFFFFF,&FF000000
 470 DATA &FF,&FFFFFFFF,0,0
 480 DATA 0,0,0,0
 490 DATA 0,0,&FFFFFFFF,&FF000000
 500 DATA &FF,&FFFFFFFF,0,0
 510 DATA 0,0,&FFFFFFFF,&FF000000
 520 DATA &10101FF,&F1F1F1F1,&F1F1F1F1,&F1F1F1F1
 530 DATA &F1F1F1F1,&F1F1F1F1,&F1F1F1F1,&F1F1F1F1
 540 DATA &F1F1F1F1,&F1F1F1F1,&F1F1F1F1,&FF010101
 550 :
 560 DATA "B.CHECK"
 570 DATA &DFC0FFFF,&DFDFDFDF,&DFD1D1D1,&DFDFDFDF
 580 DATA &DFD1D1D1,&DFDFDFDF,&DFD1D1D1,&DFDFDFDF
 590 DATA &DFD1D1D1,&DFDFDFDF,&DFD1D1D1,&FFFFC0
 600 DATA &FF00FFFF,&FF1F1F1F,&FFF1F1F1,&FFFF00
 610 DATA &FF00FFFF,&FF1F1F1F,&FFF1F1F1,&FFFF00
 620 DATA &FF00FFFF,&FF1F1F1F,&FFF1F1F1,&DFDFDF1F
 630 DATA &DFD1D1D1,&DFDFDFDF,&DFD1D1D1,&DFDFDFDF
 640 DATA &FF11D1D1,&FF1F1F1F,&FFF1F1F1,&FFFF00
 650 DATA &FF00FFFF,&FF1F1F1F,&FFF1F1F1,&F6171710
 660 DATA &F6F6F6F6,&F6161616,&F6F6F6F6,&F6161616
 670 DATA &FFF0F7F7,&FF1F1F1F,&FFF1F1F1,&FFFF00
 680 DATA &FF00FFFF,&FF1F1F1F,&FFF1F1F1,&FFFF00
 690 DATA &FF00FFFF,&FF1F1F1F,&FFF1F1F1,&FFFF00
 700 DATA &F606FEFE,&F6161616,&F6F6F6F6,&F6161616
 710 DATA &F6F6F6F6,&F6161616,&F6F6F6F6,&F6161616
 720 DATA &F6F6F6F6,&F6161616,&F6F6F6F6,&FEFE06
```

Listing 5.

```
  10  REM Program to convert AMX fonts
  95  oldfont=&5800:newfont=&4880
 100  PROCassemble:X=0
 110  REPEAT:INPUT"Font name? "F$
 120  IF LEFT$(F$,1)="*" THEN OSCLI(F$):GOTO90
 130  X=OPENIN("F."+F$):IF X=0 THEN PRINT"NO SUCH FONT"
 140  UNTIL X>0 OR F$=""
 150  IF F$<>"" THEN CLOSE#X ELSE END
 160  OSCLI("LOAD F."+F$+" 57DA")
 190 :
 720  D$="AMX FONT - "+F$
 760  OSCLI("SAVE G."+F$+" 4800 +C00")
 770  OSCLI("SAVE S."+F$+" 4800 +80")
 790 :
 800  REM - delete 1210 to 1380
```

Listing 6.

```
  10 REM Character Designer
  20 REM by Richard Abbotts
  30 REM for B+/M/C
  40 REM (c) BAU November 1989
  50 :
  60 DIM K%(15,15),mask%(7)
  70 FOR M%=0 TO 7:READ mask%(M%):NEXT M%
  80 fonttop=&4880:fontbottom=&4880+&5C0
  90 space%=&4800
 100 arrow$=CHR$136+CHR$137+CHR$138+CHR$139
 110 MODE 4:HIMEM=&4800
 120 *FX 4,1
 130 PROCgrid
 140 C%=65
 150 X%=0:Y%=0:ink%=0:pen%=FALSE
 160 :
 170 VDU 28,13,21,39,0
 180 REPEAT:PROCmenu:PROCdisplay
 190 REPEAT
 200 PROCcursor
 210 *FX 15,1
 220 REPEAT:G=INSTR(arrow$+"POIXZLSUFD/<>QC",GET$):UNTIL G>0
 230 PROCcursor
 240 IF G<5 THEN PROCmove
 250 UNTIL G>4
 260 IF G=5 THEN pen%=NOT pen%
 270 IF G=6 THEN ink%=0
 280 IF G=7 THEN ink%=1
```

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DESIGN

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```
  290 IF G=8 AND C%<122 THEN C%=C%+
1
  300 IF G=9 AND C%>32 THEN C%=C%-1
  310 IF G=10 THEN PROCpatient:PROC
unstore(C%)
  320 IF G=11 THEN PROCpatient:PROC
store(C%)
  330 IF G=12 THEN PROCpatient:PROC
fill(0)
  340 IF G=13 THEN PROCpatient:PROC
fill(1)
  350 IF G=14 THEN PROCdisc
  360 IF G=15 THEN PROCpatient:PROC
reflect
  370 IF G=16 THEN PROCpatient:PROC
left
  380 IF G=17 THEN PROCpatient:PROC
right
  390 IF G=19 THEN PROCpatient:PROC
clear
  400 UNTIL G=18
  410 *FX 4
  420 END
  430 :
  440 DEF PROCmenu
  450 CLS
  460 C$=CHR$C%
  470 PRINT"P  O  I"
  480 IF pen% THEN PRINT"PEN DOWN"
ELSE PRINT"PEN UP"
  490 IF ink%=1 THEN PRINT"INK"ELSE
 PRINT"WIPE"
  500 PRINT''"S-tore as char ";STR$
C%;" "C$'"L-oad char ";STR$C%;" "C$
  510 PRINT'"/  reflect"'"F-ILL "'"
U-NFIL"
  520 PRINT"<> - shift left or righ
t"
  530 PRINT"Z - X  other characters
"
  540 PRINT"C - clear buffer"
  550 PRINT''"D-ISC ACCESS"
  560 ENDPROC
  570 :
  580 DEF PROCon
  590 K%(X%,Y%)=ink%
  600 PROCsquare
  610 ENDPROC
  620 :
  630 DEF PROCsquare
  640 GCOL 0,ink%
  650 U%=X%*20:V%=Y%*20
  660 MOVE U%,V%:DRAW U%,V%+12:PLOT
 85,U%+12,V%:PLOT 85,U%+12,V%+12
  670 ENDPROC
  680 :
  690 DEF PROCstore(asc%)
  700 A%=fonttop+16*(asc%-32)
  710 B%=fontbottom+16*(asc%-32)
  720 W%=space%+asc%
  730 max%=0
  740 FOR X%=15 TO 0 STEP-1:byte%=0
  750 FOR Y%=8 TO 15
  760 byte%=byte%+mask%(Y%-8)*K%(X%
,Y%)
  770 NEXT Y%
  780 IF byte%>0 AND max%=0 THEN ma
x%=X%
  790 A%?X%=byte%
  800 byte%=0
  810 FOR Y%=0 TO 7
  820 byte%=byte%+mask%(Y%)*K%(X%,Y
%)
  830 NEXT Y%
  840 IF byte%>0 AND max%=0 THEN ma
x%=X%
  850 B%?X%=byte%
  860 NEXT X%
  870 max%=max%+2:IF max%>16 THEN m
ax%=16
  880 ?W%=max%
  890 X%=0:Y%=0
  900 PROCbip
  910 ENDPROC
  920 :
  930 DEF PROCunstore(asc%)
  940 A%=fonttop+16*(asc%-32)
  950 B%=fontbottom+16*(asc%-32)
  960 W%=space%+asc%
  970 FOR X%=0 TO 15
  980 byte%=A%?X%
  990 FOR Y%=8 TO 15
 1000 IF byte% AND mask%(Y%-8) THEN
 K%(X%,Y%)=1 ELSE K%(X%,Y%)=0
 1010 ink%=K%(X%,Y%):PROCon
 1020 NEXT Y%
 1030 byte%=B%?X%
 1040 FOR Y%=0 TO 7
 1050 IF byte% AND mask%(Y%) THEN K
%(X%,Y%)=1 ELSE K%(X%,Y%)=0
 1060 ink%=K%(X%,Y%):PROCon
 1070 NEXT Y%
 1080 NEXT X%
 1090 X%=0:Y%=0
 1100 PROCbip
 1110 ENDPROC
 1120 :
 1130 DEF PROCmove
 1140 IF G=1 AND X%>0 THEN X%=X%-1
 1150 IF G=2 AND X%<15 THEN X%=X%+1
 1160 IF G=3 AND Y%>0 THEN Y%=Y%-1
 1170 IF G=4 AND Y%<15 THEN Y%=Y%+1
 1180 IF pen% THEN K%(X%,Y%)=ink%:P
ROCon
 1190 ENDPROC
 1200 :
 1210 DEF PROCclear
 1220 FOR A%=0 TO &C00 STEP 4
 1230 A%!space%=0
 1240 NEXT A%
 1250 ENDPROC
 1260 :
 1270 DEF PROCcursor
 1280 GCOL 3,1
 1290 MOVE X%*20,Y%*20+8
 1300 DRAW X%*20+12,Y%*20+8
 1310 MOVE X%*20+8,Y%*20
 1320 DRAW X%*20+8,Y%*20+12
 1330 ENDPROC
 1340 :
 1350 DEF PROCgrid
 1360 GCOL 0,1
 1370 FOR X%=16 TO 296 STEP 20:MOVE
 X%,0:DRAW X%,312:MOVE 0,X%:DRAW 31
2,X%
 1380 NEXT X%
 1390 ENDPROC
 1400 :
 1410 DEF PROCreflect
 1420 FOR X%=8 TO 15
 1430 FOR Y%=0 TO 15
 1440 K%(X%,Y%)=K%(15-X%,Y%)
 1450 ink%=K%(X%,Y%):PROCon
 1460 NEXT Y%
 1470 NEXT X%
 1480 X%=0:Y%=0
 1490 PROCbip
 1500 ENDPROC
 1510 :
 1520 DEF PROCfill(col%)
 1530 ink%=col%
 1540 FOR X%=0 TO 15:FOR Y%=0 TO 15
 1550 K%(X%,Y%)=ink%:PROCon
 1560 NEXT Y%:NEXT X%
 1570 X%=0:Y%=0
 1580 PROCbip
 1590 ENDPROC
 1600 :
 1610 DEF PROCdisc
 1620 LOCAL G
 1630 CLS
 1640 *FX 15,1
 1650 PRINT"R = read in a"'"font fi
le"''
 1660 PRINT"W = write this"'"file t
o disc"''
 1670 REPEAT:G=INSTR("-RrWw"+CHR$13
,GET$) DIV 2:UNTIL G>0
 1680 IF G=1 THEN PROCload
 1690 IF G=2 THEN PROCsave
 1700 ENDPROC
 1710 :
 1720 DEF PROCload
 1730 INPUT "Name of font to load
    from disc "F$
 1740 IF F$="" THEN ENDPROC
 1750 OSCLI("LOAD "+F$+" 4800")
 1760 ENDPROC
 1770 :
 1780 DEF PROCsave
 1790 space%?32=12
 1800 INPUTLINE"Description "D$
 1810 IF LEND$>30 THEN D$=LEFT$(D$,
30)
 1820 $space%=D$
 1830 INPUT"Full name of font to sa
ve        to disc "F$
 1840 IF F$="" THEN ENDPROC
 1850 OSCLI("SAVE "+F$+" 4800 +C00"
)
 1860 ENDPROC
 1870 :
 1880 DEF PROCleft
 1890 FOR Y%=0 TO 15:FOR X%=0 TO 14
 1900 K%(X%,Y%)=K%(X%+1,Y%):ink%=K%
(X%,Y%):PROCon
 1910 NEXT X%
 1920 K%(15,Y%)=0:ink%=0:PROCon
 1930 NEXT Y%
 1940 X%=0:Y%=0
 1950 PROCbip
 1960 ENDPROC
 1970 :
 1980 DEF PROCright
 1990 FOR Y%=0 TO 15:FOR X%=15 TO 1
 STEP -1
 2000 K%(X%,Y%)=K%(X%-1,Y%):ink%=K%
(X%,Y%):PROCon
 2010 NEXT X%
 2020 K%(0,Y%)=0:ink%=0:PROCon
 2030 NEXT Y%
 2040 X%=0:Y%=0
 2050 PROCbip
 2060 ENDPROC
 2070 :
 2080 DEF PROCbip
 2090 SOUND 1,-12,200,3
 2100 ENDPROC
 2110 :
 2120 DEF PROCpatient
 2130 SOUND 1,-10,50,3
 2140 CLS
 2150 PRINT''"PLEASE WAIT"
 2160 ENDPROC
 2170 :
 2180 DEF PROCdisplay
 2190 D%=C%-32
 2200 FOR A%=0 TO 7
 2210 ?(&5947-A%)=A%?(fonttop+16*D%
)
 2220 ?(&594F-A%)=A%?(fontbottom+16
*D%)
 2230 NEXT A%
 2240 FOR A%=8 TO 15
 2250 ?(&580F-A%)=A%?(fonttop+16*D%
)
 2260 ?(&5817-A%)=A%?(fontbottom+16
*D%)
 2270 NEXT A%
 2280 ENDPROC
 2290 :
 2300 DATA 1,2,4,8,16,32,64,128
```

Listing 7.

```
   10 REM Border Design
   20 REM by Richard Abbotts
   30 REM for B+/M/C
   40 REM (c) BAU November 1989
   50 :
   60 *FX 4,1
   70 fonttop=&5700
   80 fontbottom=&5780
   90 :
  100 arrow$=CHR$136+CHR$137+CHR$13
8+CHR$139
  110 DIM K%(7,15,15),mask%(7),WX%(
8),WY%(8),VX%(7),VY%(7)
  120 FOR M%=0 TO 7:READ mask%(M%):
NEXT M%
  130 FOR M%=0 TO 7:READ WX%(M%),WY
%(M%):NEXT M%
  140 FOR M%=0 TO 7:READ VX%(M%),VY
%(M%):NEXT M%
  150 REPEAT:MODE 4:HIMEM=&5700:PRO
Cgrid
  160 X%=0:Y%=0:ink%=0:pen%=FALSE:C
%=0:PROCchar
  170 VDU 28,30,31,39,0
  180 REPEAT:PROCmenu
  190 REPEAT
  200 PROCcursor
  210 REPEAT:G=INSTR(arrow$+"POI``V
SUFD/C*Q@W01234567",GET$):UNTIL G>0
  220 PROCcursor
  230 IF G<5 THEN PROCmove
  240 UNTIL G>4
  250 IF G=5 THEN pen%=NOT pen%
  260 IF G=6 THEN ink%=0
  270 IF G=7 THEN ink%=1
  280 IF G=20 THEN PROCpatient:PROC
see
  290 IF G=10 THEN PROCpatient:PROC
unstore
  300 IF G=11 THEN PROCpatient:PROC
store
  310 IF G=12 THEN PROCpatient:PROC
fill(0)
  320 IF G=13 THEN PROCpatient:PROC
fill(1)
  330 IF G=14 THEN PROCdisc
  340 IF G=15 THEN PROCpatient:PROC
reflect
  350 IF G=16 THEN PROCclear
  360 IF G=19 THEN PROCpatient:PROC
rotate
  370 IF G>20 AND G<29 THEN PROCcha
r:C%=G-21:PROCchar
  380 PROCbip
  390 UNTIL G=17 OR G=18
  400 MODE 7
  410 IF G=17 THEN PROCstar
  420 UNTIL G=18
  430 END
  440 :
  450 DEF PROCmenu:CLS:PRINT"P I O"
  460 IF pen% THEN PRINT"PEN DOWN"
ELSE PRINT"PEN UP"
  470 IF ink%=1 THEN PRINT"INK"ELSE
 PRINT"WIPE"
  480 PRINT"S-tore"'"V-iew"'"W-hole
"'"/ reflect"'"@ rotate"
  490 PRINT"F-ill"'"U-nfill"'
  500 PRINT"D-isc "'"Q-uit"
  510 ENDPROC
  520 DEF PROCon
  530 K%(C%,X%,Y%)=ink%
  540 PROCsquare
  550 :
  560 ENDPROC
  570 DEF PROCsquare
  580 GCOL 0,ink%
  590 U%=WX%(C%)+X%*20:V%=WY%(C%)+Y
%*20
  600 MOVE U%,V%:DRAW U%,V%+12:PLOT
 85,U%+12,V%:PLOT 85,U%+12,V%+12
  610 ENDPROC
  620 :
  630 DEF PROCstore
  640 FOR C%=0 TO 7
  650 A%=fonttop+16*C%
  660 B%=fontbottom+16*C%
  670 :
  680 max%=0
  690 FOR X%=15 TO 0 STEP-1:byte%=0
  700 FOR Y%=8 TO 15
  710 byte%=byte%+mask%(Y%-8)*K%(C%
,X%,Y%)
  720 NEXT Y%
  730 :
  740 A%?X%=byte%
  750 byte%=0
  760 FOR Y%=0 TO 7
  770 byte%=byte%+mask%(Y%)*K%(C%,X
%,Y%)
  780 NEXT Y%
  790 :
  800 B%?X%=byte%
  810 NEXT X%
  820 :
  830 NEXT C%
  840 X%=0:Y%=0:C%=0
  850 ENDPROC
  860 :
  870 DEF PROCsee
  880 FOR C%=0 TO 7
  890 PROCunstore
  900 NEXT C%
  910 C%=0
  920 ENDPROC
  930 :
  940 DEF PROCunstore
  950 A%=fonttop+16*C%
  960 B%=fontbottom+16*C%
  970 :
  980 FOR X%=0 TO 15
  990 byte%=A%?X%
 1000 FOR Y%=8 TO 15
 1010 IF byte% AND mask%(Y%-8) THEN
 K%(C%,X%,Y%)=1 ELSE K%(C%,X%,Y%)=0
 1020 ink%=K%(C%,X%,Y%):PROCon
 1030 NEXT Y%
 1040 byte%=B%?X%
 1050 FOR Y%=0 TO 7
 1060 IF byte% AND mask%(Y%) THEN K
%(C%,X%,Y%)=1 ELSE K%(C%,X%,Y%)=0
 1070 ink%=K%(C%,X%,Y%):PROCon
 1080 NEXT Y%
 1090 NEXT X%
 1100 X%=0:Y%=0
 1110 ENDPROC
 1120 :
 1130 DEF PROCmove
 1140 IF G=1 AND X%>0 THEN X%=X%-1
 1150 IF G=2 AND X%<15 THEN X%=X%+1
```

Continued ▶

WORDPROCESSING

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```
 1160 IF G=3 AND Y%>0 THEN Y%=Y%-1
 1170 IF G=4 AND Y%<15 THEN Y%=Y%+1
 1180 IF pen% THEN K%(C%,X%,Y%)=ink
%:PROCon
 1190 ENDPROC
 1200 :
 1210 DEF PROCclear
 1220 FOR A%=0 TO &100 STEP 4
 1230 A%!fonttop=0
 1240 NEXT A%
 1250 ENDPROC
 1260 :
 1270 DEF PROCchar
 1280 GCOL 3,1:VDU 5:MOVE VX%(C%),V
Y%(C%):VDU 48+C%,4
 1290 ENDPROC
 1300 DEF PROCcursor
 1310 GCOL 3,1
 1320 U%=WX%(C%)+X%*20:V%=WY%(C%)+Y
%*20
 1330 MOVE U%,V%+8
 1340 DRAW U%+12,V%+8
 1350 MOVE U%+8,V%
 1360 DRAW U%+8,V%+12
 1370 ENDPROC
 1380 :
 1390 DATA 1,2,4,8,16,32,64,128
 1400 DATA 0,640,320,640,640,640,0,
320,640,320,0,0,320,0,640,0
 1410 DATA 420,512,460,512,500,512,
420,472,500,472,420,432,460,432,500
,432
 1420 :
 1430 DEF PROCgrid
 1440 GCOL 0,1
 1450 FOR X%=16 TO 936 STEP 20:MOVE
 X%,0:DRAW X%,952:MOVE 0,X%:DRAW 95
2,X%:NEXT
 1460 GCOL 0,0:MOVE 320,320:DRAW 32
0,632:PLOT 85,632,320:PLOT 85,632,6
32
 1470 GCOL 0,1
 1480 MOVE 460,400:DRAW 460,520
 1490 MOVE 500,400:DRAW 500,520
 1500 MOVE 420,440:DRAW 540,440
 1510 MOVE 420,480:DRAW 540,480
 1520 FOR C%=0 TO 7:PROCchar:NEXT
 1530 ENDPROC
 1540 :
 1550 DEF PROCfill(col%)
 1560 ink%=col%
 1570 FOR X%=0 TO 15:FOR Y%=0 TO 15
 1580 K%(C%,X%,Y%)=ink%:PROCon
 1590 NEXT Y%:NEXT X%
 1600 X%=0:Y%=0
 1610 ENDPROC
 1620 :
 1630 DEF PROCreflect
 1640 PROCtrans(0,2,1)
 1650 PROCtrans(0,5,2)
 1660 PROCtrans(5,7,1)
 1670 PROCtrans(1,6,2)
 1680 PROCtrans(1,4,3)
 1690 PROCtrans(1,3,4)
 1700 ENDPROC
 1710 :
 1720 DEF PROCrotate
 1730 PROCtrans(0,2,5)
 1740 PROCtrans(1,4,5)
 1750 PROCtrans(2,7,5)
 1760 PROCtrans(4,6,5)
 1770 PROCtrans(7,5,5)
 1780 PROCtrans(6,3,5)
 1790 ENDPROC
 1800 :
 1810 DEF PROCtrans(E%,F%,G%)
 1820 C%=F%
 1830 FOR X%=0 TO 15
 1840 FOR Y%=0 TO 15
 1850 IF G%=1 THEN K%(F%,X%,Y%)=K%(
E%,15-X%,Y%)
 1860 IF G%=2 THEN K%(F%,X%,Y%)=K%(
E%,X%,15-Y%)
 1870 IF G%=3 THEN K%(F%,X%,Y%)=K%(
E%,Y%,X%)
 1880 IF G%=4 THEN K%(F%,X%,Y%)=K%(
E%,15-Y%,15-X%)
 1890 IF G%=5 THEN K%(F%,X%,Y%)=K%(
E%,15-Y%,X%)
 1900 ink%=K%(F%,X%,Y%)
 1910 PROCon
 1920 NEXT Y%,X%
 1930 ENDPROC
 1940 :
 1950 DEF PROCdisc
 1960 LOCAL G
 1970 CLS
 1980 *FX 15,1
 1990 PRINT"R =read infile"
 2000 PRINT'"W =write"'"this file"'
"to disc"
 2010 REPEAT:G=INSTR("-RrWw"+CHR$13
,GET$)DIV 2:UNTIL G>0
 2020 IF G=1 THEN PROCload
 2030 IF G=2 THEN PROCsave
 2040 ENDPROC
 2050 :
 2060 DEF PROCload
 2070 REPEAT
 2080 PRINT "Full name"'"of border"
'"file to"'"load from"'"disc":INPUT
 F$
 2090 ch=OPENIN F$
 2100 IF ch=0 THEN PRINT"No such"'"
file"'"RETURN"'"to exit"
 2110 UNTIL F$="" OR ch>0
 2120 IF F$="" THEN ENDPROC
 2130 OSCLI("LOAD "+F$+" 5700")
 2140 PROCbip
 2150 ENDPROC
 2160 :
 2170 DEF PROCsave
 2180 REPEAT:R$="N"
 2190 PRINT "Full name for this bor
der file":INPUT F$
 2200 ch=OPENIN F$
 2210 IF ch>0 THEN INPUT"Overwrite?
 "R$
 2220 IF ch>0 THEN CLOSE#ch
 2230 UNTIL ch=0 OR LEFT$(R$,1)="Y"
 2240 OSCLI("SAVE "+F$+" 5700 +100"
)
 2250 PROCbip
 2260 ENDPROC
 2270 :
 2280 DEF PROCbip
 2290 SOUND 1,-12,200,3
 2300 ENDPROC
 2310 :
 2320 DEF PROCpatient
 2330 SOUND 1,-10,50,3
 2340 CLS:PRINT "Please"'"wait"
 2350 ENDPROC
 2360 :
 2370 DEF PROCstar
 2380 INPUT"*"s$
 2390 OSCLI(s$)
 2400 PRINT'''"PRESS SPACE":REPEAT
UNTIL GET=32
 2410 ENDPROC
```

See Drive, page 79

Listing 1.

```
   10 REM VIEW Printer Driver
   20 REM by C.M.Ferrington
   30 REM for B/B+/M/C with Basic I
I
   40 REM (c) BAU November 1989
   50 :
   60 DIM driver_code &100
   70 :
   80 MODE 3
   90 oscli=&FFF7
  100 osasci=&FFE3
  110 oswrch=&FFEE
  120 :
  130 star=&0A
  140 alternate=&0B
  150 pad=&0D
  160 backspace=&0E
  170 control=&0F
  180 :
  190 flags=&CEA
  200 sflag=flags+10
  210 aflag=flags+11
  220 cflag=flags+15
  230 pflag=flags+18
  240 pound_char=&CFF
  250 command_line=&500
  260 control_line=&AEE
  270 :
  280 PROCcontrol_codes
  290 PROCdriver
  300 PROCsave
  310 END
  320 :
  330 DEF PROCdriver
  340 FOR pass%=4 TO 7 STEP 3
  350 P%=&400:O%=driver_code
  360 [OPT pass%
  370 JMP print
  380 JMP pinit
  390 JMP proff
  400 JMP hmi
  410 JMP hmi
  420 .pinit
  430 LDA pflag
  440 BEQ pron
  450 LDA #&00
  460 LDX #&12
  470 .init
  480 STA flags,X
  490 DEX
  500 BPL init
  510 .pron
  520 LDA #2
  530 JMP oswrch
  540 .proff
  550 LDA #3
  560 JMP oswrch
  570 .print
  580 PHP:PHA
  590 STX tempx
  600 STY tempy
  610 .star_flag_test
  620 LDX sflag
  630 BEQ control_flag_test
  640 JSR star_command
  650 JMP return
  660 .control_flag_test
  670 LDX cflag
  680 BEQ test_for_highlight
  690 JSR control_line
  700 JMP return
  710 .test_for_highlight
  720 CMP #&80
  730 BCC not_highlight
  740 JSR special_effects
  750 .return
  760 LDY tempy
  770 LDX tempx
  780 PLA:PLP
  790 .hmi
  800 RTS
  810 .not_highlight
  820 CMP #&21
  830 BCC print_it
  840 ORA aflag
  850 .pound
  860 CMP #&60
  870 BNE print_it
  880 LDA pound_char
  890 .print_it
  900 JSR osasci
  910 JMP return
  920 .special_effects
  930 SEC
  940 SBC #&80
  950 TAX
  960 CMP #star:BNE next1
  970 INC sflag
  980 RTS
  990 .next1
 1000 CMP #alternate:BNE next2
 1010 LDA aflag
 1020 EOR #&80
 1030 STA aflag
 1040 RTS
 1050 .next2
 1060 CMP #pad:BNE next3
 1070 LDA #32
 1080 JMP pronly
 1090 .next3
 1100 CMP #backspace:BNE next4
 1110 LDA #8
 1120 JMP pronly
 1130 .next4
 1140 CMP #control:BNE effects_on
 1150 INC cflag
 1160 RTS
 1170 .effects_on
 1180 LDA flags,X
 1190 BNE effects_off
 1200 LDA control_codes,X
 1210 JSR pronly
 1220 LDA on,X
 1230 STA flags,X
 1240 JSR pronly
 1250 LDA on2,X
 1260 JSR pronly
 1270 RTS
 1280 .effects_off
 1290 LDA control_codes,X
 1300 JSR pronly
 1310 LDA off,X
 1320 JSR pronly
 1330 LDA off2,X
 1340 JSR pronly
 1350 LDA #&00
 1360 STA flags,X
 1370 RTS
 1380 .pronly
 1390 PHA
 1400 LDA #1
 1410 JSR oswrch
 1420 PLA
 1430 JMP oswrch
 1440 .star_command
 1450 DEX
 1460 INC sflag
 1470 CMP #(star+&80)
 1480 BEQ send_command
 1490 STA command_line,X
 1500 RTS
 1510 .send_command
 1520 LDA #&0D
 1530 STA command_line,X
 1540 LDX #0
 1550 STX sflag
 1560 LDX #command_line MOD 256
 1570 LDY #command_line DIV 256
 1580 JMP oscli
 1590 .tempx EQUB &00
 1600 .tempy EQUB &00
 1610 ]
 1620 NEXT
 1630 end_driver=O%
 1640 ENDPROC
 1650 :
 1660 DEF PROCcontrol_codes
 1670 P%=&C90
 1680 :
 1690 [OPT 3
 1700 .control_codes
 1710 EQUB&1B:EQUB&1B:EQUB&1B:EQUB&
1B:EQUB&1B:EQUB&1B:EQUB&1B:EQUB&1B:
EQUB&1B
 1720 EQUB&1B:EQUB&00:EQUB&00:EQUB&
00:EQUB&00:EQUB&00:EQUB&00:EQUB&1B:
EQUB&1B
 1730 .on
 1740 EQUB&2D:EQUB&45:EQUB&53:EQUB&
53:EQUB&70:EQUB&78:EQUB&34:EQUB&56:
EQUB&57
 1750 EQUB&47:EQUB&00:EQUB&00:EQUB&
00:EQUB&00:EQUB&00:EQUB&00:EQUB&4A:
EQUB&6A
 1760 .on2
 1770 EQUB&01:EQUB&00:EQUB&00:EQUB&
01:EQUB&01:EQUB&01:EQUB&00:EQUB&01:
EQUB&01
 1780 EQUB&00:EQUB&00:EQUB&00:EQUB&
00:EQUB&00:EQUB&00:EQUB&00:EQUB&0C:
EQUB&0C
 1790 .off
 1800 EQUB&2D:EQUB&46:EQUB&54:EQUB&
54:EQUB&70:EQUB&78:EQUB&35:EQUB&56:
EQUB&57
 1810 EQUB&48:EQUB&00:EQUB&00:EQUB&
00:EQUB&00:EQUB&00:EQUB&00:EQUB&4A:
EQUB&6A
 1820 .off2
 1830 EQUB&00:EQUB&00:EQUB&00:EQUB&
00:EQUB&00:EQUB&00:EQUB&00:EQUB&00:
EQUB&00
 1840 EQUB&00:EQUB&00:EQUB&00:EQUB&
00:EQUB&00:EQUB&00:EQUB&00:EQUB&0C:
EQUB&0C
```

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```
1850 EQUS STRING$(19,CHR$(0))
1860 EQUB&1B:EQUB&40:EQUB&9C
1870 ]
1880 end_codes=P%
1890 ENDPROC
1900 :
1910 DEF PROCsave
1920 N$="SAVE :0.!driver "+STR$~(driver_code)+" "+STR$~(end_driver)
1930 PRINT 'N$'
1940 OSCLI(N$)
1950 N$="SAVE :0.!codes C90 "+STR$~(end_codes)
1960 PRINT N$
1970 OSCLI(N$)
1980 ENDPROC
```

Listing 2.

```
10 REM Printer control code editor
20 REM by C.M. Ferrington
30 REM for B/B+/M/C with Basic II
40 REM (c) BAU November 1989
50 :
60 IF HIMEM=&8000:MODE 1:mode=0
70 IF HIMEM<&8000:MODE 4:mode=1
80 :
90 PROCinit
100 PROCload_codes
110 PROCedit_codes
120 PROCsave_codes
130 PROCedit_chars
140 :
150 *FX 4,0
160 *FX 229,0
170 MODE 3
180 END
190 :
200 DEF PROCinit
210 DIM block 30,C$(6,18),col(1,4)
220 col(0,0)=0:col(0,1)=1:col(0,2)=2:col(0,3)=3
230 col(1,0)=0:col(1,1)=1:col(1,2)=1:col(1,3)=1
240 buffer=&900
250 *FX 4,1
260 *FX 229,1
270 CLOSE#0
280 PRINTTAB(4,2)"Printer"TAB(15,2)"CTRL"
290 PRINTTAB(21,2)"on "TAB(26,2)"on "
300 PRINTTAB(31,2)"off"TAB(36,2)"off"
310 PRINTTAB(4,3)"effect"TAB(15,3)"code"
320 PRINTTAB(22,3)"1"TAB(27,3)"2"
330 PRINTTAB(32,3)"1"TAB(37,3)"2"
340 FOR I=5 TO 27
350 PRINTTAB(00,I)":"TAB(14,I)":"
360 PRINTTAB(19,I)":"TAB(24,I)":"
370 PRINTTAB(29,I)":"TAB(34,I)":"
380 PRINTTAB(39,I)":":NEXT
390 ENDPROC
400 :
410 DEF PROCload_codes
420 d$=FNdrive("read from")
430 PROCclear(29,3)
440 PRINTTAB(14,29)"codes file ?"
450 PRINTTAB(16,31)"c.";
460 f$=FNin(18,31,7,"!","~","f")
470 $&A00=d$+"h."+f$
480 c$=d$+"c."+f$
490 e$=d$+"e."+f$
500 F=0
510 IF f$<>"" F=OPENUP(c$)
520 IF F>0:CLOSE#F:OSCLI("LOAD "+c$):F=OPENUP(e$)
530 PROCclear(29,3)
540 IF F>0 PRINTTAB(10,0) "editing ";c$;
550 IF F=0 PRINTTAB(10,0) "creating c.";f$;
560 IF f$="" PRINTTAB(POS-2,VPOS)"new file"
570 code=&C90
580 IF F=0:FOR I=1 TO 18:FOR J=1 TO 6:READ C$(J,I):NEXT:NEXT
590 IF F=0:READ code1,code2,pound
600 FOR J=1 TO 6
610 FOR I=1 TO 18
620 IF F>0 AND J=1 INPUT#F,C$(J,I)
630 IF F>0 AND J>1 C$(J,I)=STR$(?code):code=code+1
640 NEXT
650 NEXT
660 IF F>0 code1=?(&CFD)
670 IF F>0 code2=?(&CFE)
680 IF F>0 pound=?(&CFF)
690 Y=3
700 FOR I=1 TO 18
710 IF I=11 I=17
720 Y=Y+2
730 COLOUR col(mode,2)
740 PRINTTAB(1,Y) C$(1,I);
750 FOR J=2 TO 6
760 IF J=2 COLOUR col(mode,3)
770 IF J>2 COLOUR col(mode,2)
780 IF J>4 COLOUR col(mode,1)
790 X=(J-1)*5+10
800 IF (J MOD 2=1) PROCascii(X,Y,C$(J,I),FALSE)
810 IF (J MOD 2=0) PROCnumeric(X,Y,C$(J,I),FALSE)
820 NEXT
830 NEXT
840 CLOSE#0
850 ENDPROC
860 :
870 DEF PROCascii(X,Y,v$,skip)
880 code=VAL(v$)
890 IF code<33 OR code>126 PROCnumeric(X,Y,v$,skip):ENDPROC
900 PRINTTAB(X,Y) "  ";CHR$(code);
910 ENDPROC
920 :
930 DEF PROCnumeric(X,Y,v$,skip)
940 IF skip ENDPROC
950 IF LEN(v$)=2 X=X+1
960 IF LEN(v$)=1 X=X+2
970 PRINTTAB(X,Y)v$;
980 ENDPROC
990 :
1000 DEF PROCedit_codes
1010 COLOUR col(mode,3)
1020 PROCclear(29,3)
1030 PRINTTAB(8,29) "use - cursor keys to move"
1040 PRINTTAB(8,31) "    - CTRL/Q to quit";
1050 I=1:J=1
1060 REPEAT
1070 Y=3+I*2:IF I>10 Y=Y-12
1080 IF J=1 COLOUR col(mode,2)
1090 IF J=2 COLOUR col(mode,3)
1100 IF J>2 COLOUR col(mode,2)
1110 IF J>4 COLOUR col(mode,1)
1120 xoffset=1:IF J>1 xoffset=10
1130 X=xoffset+(J-1)*5
1140 IF J=1 T$=FNin(X,Y,13,"!","~","f")
1150 IF J>1 T$=FNin(X,Y,3,"0123456789","","r")
1160 IF T$<>"" C$(J,I)=T$:IF J=3 OR J=5 PROCascii(X,Y,T$,TRUE)
1170 I=I-up+down
1180 J=J-left+right
1190 IF J>6 J=1
1200 IF J<1 J=6
1210 IF I<1 I=18
1220 IF I>18 I=1
1230 IF I=11 I=17
1240 IF I=16 I=10
1250 UNTIL quit
1260 COLOUR col(mode,3)
1270 PROCclear(29,3)
1280 PRINTTAB(1,29) "Printer reset code 1 [";STR$(code1);"]";
1290 PRINTTAB(1,31) "              code 2 [";STR$(code2);"]";
1300 T$=FNin(28,29,3,"0123456789","","f")
1310 IF T$<>"" code1=VAL(T$)
1320 T$=FNin(28,31,3,"0123456789","","f")
1330 IF T$<>"" code2=VAL(T$)
1340 PROCclear(29,3)
1350 PRINTTAB(1,30) "Printer pound code [";STR$(pound);"]";
1360 T$=FNin(26,30,3,"0123456789","","f")
1370 IF T$<>"" pound=VAL(T$)
1380 ENDPROC
1390 :
1400 DEF FNin(x,y,n,t1$,t2$,d$)
1410 LOCAL a%,b%,m%,n%,mask,move,mem
1420 PROCwipe
1430 REPEAT
1440 IF d$<>"r" PROCforward
1450 IF d$= "r" PROCreverse
1460 UNTIL a%=13 OR quit=TRUE
1470 PROCmove
1480 IF d$="f" mem?m%=13
1490 IF m%>0=$mem
1500 =""
1510 :
1520 DEF PROCforward
1530 PROCgetchar(POS,VPOS)
1540 IF a%=127:IF m%>0 m%=m%-1:VDU a%
1550 IF b%>0:IF m%=0 PRINT SPC(n%);:VDU31,x,y
1560 IF b%>0:IF m%<>n% mem?m%=a%:m%=m%+1:VDU a%
1570 ENDPROC
1580 :
1590 DEF PROCreverse
1600 PROCgetchar(x+n%-1,y)
1610 PROCremove
1620 PROCinsert
1630 ENDPROC
1640 :
1650 DEF PROCwipe
1660 VDU 31,x,y
1670 n%=ABSn
1680 mask=&FF:IF n<0 mask=&DF
1690 quit=FALSE
1700 move=2
1710 mem=block
1720 $mem=STRING$(n%," ")
1730 *FX 21,0
1740 ENDPROC
1750 :
1760 DEF PROCinsert
1770 IF b%<1 ENDPROC
1780 IF m%=n% ENDPROC
1790 FOR i=(n%-m%) TO n%
1800 mem?(i-1)=mem?i
1810 NEXT
1820 mem?(n%-1)=a%
1830 PRINTTAB(x,y) $mem;
1840 m%=m%+1
1850 ENDPROC
1860 :
1870 DEF PROCremove
1880 IF a%<>127 ENDPROC
1890 IF m%<1 ENDPROC
1900 FOR i=n%-1 TO (n%-m%) STEP -1
1910 mem?i=mem?(i-1)
1920 NEXT
1930 mem?(n%-m%)=32
1940 PRINTTAB(x,y) $mem;
1950 m%=m%-1
1960 ENDPROC
1970 :
1980 DEF PROCmove
1990 left=0:right=0:up=0:down=0
2000 IF move=1 left=1
2010 IF move=2 right=1
2020 IF move=3 down=1
2030 IF move=4 up=1
2040 ENDPROC
2050 :
2060 DEF PROCgetchar(x,y)
2070 LOCAL flag
2080 REPEAT
2090 VDU 31,x,y
2100 a%=GET
2110 IF a%>135 AND a%<140 move=a%-135:a%=13
2120 IF a%=17 quit=TRUE:a%=13
2130 IF a%>96 AND a%<123 a%=a% AND mask
2140 IF t2$="":flag=INSTR(t1$,CHR$(a%))
2150 IF t2$<>"":IF a%>=ASCt1$ AND a%<=ASCt2$ flag=a%
2160 IF a%=13 OR a%=127 flag=-1
2170 IF flag=0 VDU7
2180 IF flag>0:IF m%=n% VDU7
2190 IF a%=127:IF m%=0 VDU7
2200 UNTIL flag<>0
2210 b%=flag
2220 IF flag=-1 b%=0
2230 ENDPROC
2240 :
2250 DEF PROCsave_codes
2260 COLOUR col(mode,3)
2270 enough=TRUE
2280 changed=FALSE
2290 replace=FALSE
2300 g$=FNnewname(f$)
2310 IF g$=f$ replace=TRUE ELSE f$=g$
2320 IF NOT replace PROCspace
2330 c$=d$+"c."+f$
2340 e$=d$+"e."+f$
2350 code=&C90
2360 FOR J=2 TO 6
2370 FOR I=1 TO 18
2380 ?code=VAL(C$(J,I))
2390 code=code+1
2400 NEXT
2410 NEXT
2420 code=&CFD
2430 code?0=code1
2440 code?1=code2
2450 code?2=pound
2460 OSCLI("SAVE "+c$+" C90 D00")
2470 F=OPENOUT(e$)
2480 FORI=1 TO 18:PRINT#F,C$(1,I):NEXT
2490 CLOSE#0
2500 ENDPROC
2510 :
2520 DEF FNnewname(f$)
2530 REPEAT
2540 PROCclear(29,3)
2550 PRINTTAB(12,29)"new file name ?"
2560 PRINTTAB(16,31)"c.";
2570 PRINTTAB(18,31) f$;
2580 g$=FNin(18,31,7," ","~","f")
2590 IF g$<>"" f$=g$
2600 UNTIL f$<>""
2610 PROCclear(29,3)
2620 =f$
2630 :
2640 DEF FNdrive(m$)
2650 PROCclear(29,3)
2660 PRINTTAB(10,29)m$;" drive [0] ?";
2670 d$=FNin(20,31,1,"0123","","f")
2680 D%=VAL(d$)
2690 IF d$="" d$="0"
2700 d$=":"+d$+"."
2710 PROCclear(29,3)
2720 =d$
2730 :
2740 DEF PROCspace
2750 REPEAT
2760 d$=FNdrive("save to")
2770 enough=FNspace(D%)
2780 UNTIL enough
2790 ENDPROC
2800 :
2810 DEF FNspace(D%)
2820 block?0=D%
2830 block!1=buffer
2840 block?5=3
2850 block?6=&13
2860 block?7=0
2870 block?8=1
2880 block?9=33
2890 block?10=0
2900 X%=block:Y%=block DIV 256:A%=&7F
2910 CALL &FFF1
2920 files=buffer?5 DIV 8
2930 IF files<29 =TRUE
2940 PROCclear(29,3)
2950 PRINTTAB(8,29)"no room - change drive/disc"
2960 PRINTTAB(8,31)"   any key when ready";
2970 A=GET
2980 f=OPENUP(":0.B.EDCODES")
2990 CLOSE#f
3000 IF f=0 changed=TRUE
3010 =FALSE
3020 :
3030 DEF PROCclear(y,n)
3040 VDU 28,0,y+n-1,39,y,12,26
3050 ENDPROC
3060 :
3070 DEF PROCedit_chars
3080 PROCclear(29,3)
3090 PRINTTAB(12,29) "edit highlights ?";
3100 R$=FNin(20,31,-1,"YN","","f")
3110 IF R$="N":ENDPROC
3120 PROCclear(29,3)
3130 IF changed:PRINTTAB(10,29)"replace program disc"
3140 IF changed:PRINTTAB(10,31)"any key to continue";:A=GET
```

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```
 3150 $&A20=f$:$&A30=d$:?&A40=chang
ed
 3160 start=buffer
 3170 FOR I=1 TO 18
 3180 $start=C$(1,I)
 3190 start=start+LEN(C$(1,I))+1
 3200 NEXT
 3210 CHAIN ":0.B.EDHIGHS"
 3220 :
 3230 DATA underline,27,45,1,45,0
 3240 DATA bold,27,69,0,70,0
 3250 DATA superscript,27,83,0,84,0
 3260 DATA subscript,27,83,1,84,0
 3270 DATA proportional,27,112,1,11
2,0
 3280 DATA NLQ,27,120,1,120,0
 3290 DATA italic,27,52,0,53,0
 3300 DATA double height,27,86,1,86
,0
 3310 DATA double width,27,87,1,87,
0
 3320 DATA double strike,27,71,0,72
,0
 3330 DATA star command,0,0,0,0,0
 3340 DATA alt character,0,0,0,0,0
 3350 DATA no data,0,0,0,0,0
 3360 DATA pad character,0,0,0,0,0
 3370 DATA backspace,0,0,0,0,0
 3380 DATA ESC sequence,0,0,0,0,0
 3390 DATA half-line dwn,27,74,12,7
4,12
 3400 DATA half-line up,27,106,12,1
06,12
 3410 DATA 27,64,156
```

Listing 3.

```
   10 REM Highlight character edito
r
   20 REM by C.M. Ferrington  June
1989
   30 REM for B/B+/M/C with Basic I
I
   40 REM (c) BAU November 1989
   50 :
   60 MODE 1
   70 PROCinit
   80 REPEAT
   90 PROCchar
  100 PROCedit
  110 UNTIL done
  120 PROCsave
  130 :
  140 *FX 4,0
  150 *FX 229,0
  160 MODE 3
  170 END
  180 :
  190 DEF PROCinit
  200 DIM mask%(7),C$(18)
  210 FOR I%=0 TO 7
  220 mask%(I%)=2^(7-I%)
  230 NEXT
  240 start=&900
  250 FOR I%=1 TO 18
  260 C$(I%)=$start
  270 start=start+LEN(C$(I%))+1
  280 NEXT
  290 old$=$&A00
  300 new$=$&A20
  310 d$=$&A30
  320 changed=?&A40
  330 *load :0.!hchars
  340 F=0
  350 loaded=FALSE
  360 IF LEN(old$)>5 F=OPENUP(old$)
  370 IF F>0:CLOSE#F:OSCLI("load "+
old$):loaded=TRUE
  380 PRINTTAB(0,29) SPC(119);
  390 IF changed:PRINTTAB(10,29)"ch
ange to data disc"
  400 IF changed:PRINTTAB(10,31)"an
y key to continue";:A=GET
  410 IF F=0 AND LEN(old$)>5 F=OPEN
UP(old$)
  420 IF NOT loaded:IF F>0:CLOSE#F:
OSCLI("load "+old$)
  430 *FX 4,1
  440 CALL &A00
  450 hchar%=&82
  460 done=FALSE
  470 VDU 23,254,255,255,255,255,25
5,255,255,255
  480 ENDPROC
  490 :
  500 DEF PROCchar
  510 VDU 23,1,0;0;0;0;
  520 PRINTTAB(0,20)"Use - up/down
cursor keys to select"
  530 PRINTTAB(0,22)"    - return t
o confirm"
  540 PRINTTAB(0,24)"    - CTRL/Q t
o quit"
  550 REPEAT
  560 PRINTTAB(0,2) SPC(39);
  570 PRINTTAB(0,2) C$(hchar%-&7F);
TAB(16,2) CHR$(hchar%)
  580 PROCshow
  590 PROCkey
  600 hchar%=hchar%-up+down
  610 IF hchar%=&8C AND up>0 hchar%
=&8B
  620 IF hchar%=&8C AND down>0 hcha
r%=&8D
  630 IF hchar%>&91 hchar%=&82
  640 IF hchar%<&82 hchar%=&91
  650 UNTIL A=13 OR A=17
  660 PRINTTAB(0,20) SPC(120)
  670 PRINTTAB(0,23) SPC(159);
  680 VDU 23,1,1;0;0;0;
  690 ENDPROC
  700 :
  710 DEF PROCshow
  720 char%=&A3B+8*(hchar%-&82)
  730 PRINTTAB(16,2) CHR$(hchar%)
  740 COLOUR 129
  750 FOR I=0 TO 7
  760 byte%=char%?I
  770 VDU 31,13,8+I
  780 FOR J=0 TO 7
  790 IF (byte% AND mask%(J)) >0 PR
INT CHR$(254); ELSE PRINT " ";
  800 NEXT
  810 NEXT
  820 COLOUR 128
  830 ENDPROC
  840 :
  850 DEF PROCedit
  860 IF A=17:done=TRUE:ENDPROC
  870 PRINTTAB(3,20)"Use - cursors
keys to move"
  880 PRINTTAB(3,22)"    - 1/2 to s
et/unset"
  890 PRINTTAB(3,24)"    - return t
o repeat"
  900 PRINTTAB(3,26)"    - CTRL/Q t
o quit"
  910 X%=13:Y%=8
  920 REPEAT
  930 COLOUR 129
  940 VDU 31,X%,Y%
  950 PROCkey
  960 X%=X%-left+right
  970 Y%=Y%+down-up
  980 IF X%<13 X%=13
  990 IF X%>20 X%=20
 1000 IF Y%<8 Y%=8
 1010 IF Y%>15 Y%=15
 1020 set=INKEY(-49)
 1030 unset=INKEY(-50)
 1040 PROCupdate
 1050 UNTIL A=13 OR A=17
 1060 IF A=17 done=TRUE
 1070 COLOUR 128
 1080 PRINTTAB(0,20) SPC(120)
 1090 PRINTTAB(0,23) SPC(159);
 1100 ENDPROC
 1110 :
 1120 DEF PROCupdate
 1130 COLOUR 128
 1140 bit%=20-X%:byte%=Y%-8:char%=&
A3B+8*(hchar%-&82)
 1150 val%=char%?byte%
 1160 IF set  :char%?byte%=(val% OR
 mask%(7-bit%))
 1170 IF unset:char%?byte%=(val% AN
D (255-mask%(7-bit%)))
 1180 VDU 23,hchar%,char%?0,char%?1
,char%?2,char%?3
 1190 VDU char%?4,char%?5,char%?6,c
har%?7
 1200 VDU 23,1,0;0;0;0;31,16,2,hcha
r%
 1210 COLOUR 129
 1220 VDU 31,X%,Y%
 1230 IF unset VDU 32
 1240 IF set VDU 254
 1250 VDU 23,1,1;0;0;0;
 1260 ENDPROC
 1270 :
 1280 DEF PROCkey
 1290 left=0:right=0:up=0:down=0
 1300 A=GET
 1310 IF A=136 left=1
 1320 IF A=137 right=1
 1330 IF A=138 down=1
 1340 IF A=139 up=1
 1350 ENDPROC
 1360 :
 1370 DEF PROCsave
 1380 PRINTTAB(10,29) "save highlig
hts ? ";:INPUT""R$
 1390 IF R$<>"Y" AND R$<>"y" ENDPRO
C
 1400 OSCLI("save "+d$+"h."+new$+"
A00 +100")
 1410 ENDPROC
```

Listing 4.

```
   10 REM Highlight character loade
r
   20 REM by C.M.Ferrington April 1
989
   30 REM for B/B+/M/C with Basic I
I
   40 REM (c) BAU November 1989
   50 :
   60 oswrch=&FFEE
   70 code=&A00
   80 :
   90 FOR pass%=0 TO 2 STEP 2
  100 P%=code
  110 [ OPT pass%
  120 PHP:PHA:TXA:PHA:TYA:PHA
  130 LDX #&FF
  140 LDA #&81
  150 STA character
  160 .next_char
  170 INC character
  180 LDA character
  190 CMP #&93
  200 BEQ done
  210 LDA #&17
  220 JSR oswrch
  230 LDA character
  240 JSR oswrch
  250 LDY #0
  260 .loop
  270 INX
  280 LDA special_chars,X
  290 JSR oswrch
  300 INY
  310 CPY #8
  320 BNE loop
  330 JMP next_char
  340 .done
  350 PLA:TAY:PLA:TAX:PLA:PLP
  360 RTS
  370 .character EQUB &00
  380 .special_chars
  390 EQUD &10543810:EQUD &00FE0010
  400 EQUD &38541010:EQUD &00FE0010
  410 EQUD &40784478:EQUD &00FE0040
  420 EQUD &4C546444:EQUD &00FE0044
  430 EQUD &10101038:EQUD &00FE0038
  440 EQUD &447C4444:EQUD &00FE0044
  450 EQUD &6C544444:EQUD &00FE0044
  460 EQUD &40704078:EQUD &00FE0078
  470 EQUD &FE385410:EQUD &00105438
  480 EQUD &447C4438:EQUD &00FE0044
  490 EQUD &00000000:EQUD &00000000
  500 EQUD &7C7C7C7C:EQUD &7C7C7C7C
  510 EQUD &207C2010:EQUD &00FE0010
  520 EQUD &92C6EEFE:EQUD &00FEFEBA
  530 EQUD &C682AAEE:EQUD &00FE00EE
  540 EQUD &AA82C6EE:EQUD &00FE00EE
  550 ]
  560 end_chars=P%
  570 NEXT
  580 :
  590 N$="SAVE :0.!hchars "+STR$~(&
A00)+" "+STR$~(end_chars)
  600 PRINT'N$'
  610 OSCLI(N$)
  620 :
  630 END
```

Listing 5.

```
   10 REM Keyboard routines
   20 REM by C.M.Ferrington
   30 REM for B/B+/M/C
   40 REM (c) BAU November 1989
   50 :
   60 MODE 3
   70 osword=&FFF1
   80 osrdrm=&FFB9
   90 oswrch=&FFEE
  100 osbyte=&FFF4
  110 :
  120 command_line=&500
  130 evntv=&220
  140 code=&900
  150 control=&0F
  160 :
  170 flags=&CEA
  180 sflag=flags+10
  190 aflag=flags+11
  200 cflag=flags+15
  210 pflag=flags+18
  220 :
  230 FOR pass%=0 TO 3 STEP 3
  240 P%=&B71
  250 [OPT pass%
  260 .initialise
  270 PHP:PHA:TXA:PHA:TYA:PHA
  280 LDA evntv
  290 STA evold+1
  300 LDA evntv+1
  310 STA evold+2
  320 LDA #&FC
  330 LDY #&FF
  340 LDX #&00
  350 JSR osbyte
  360 TXA:TAY
  370 LDA #&08
  380 STA &F6
  390 LDA #&80
  400 STA &F7
  410 JSR osrdrm
  420 CMP #&03:BEQ redirect
  430 CMP #&04:BEQ redirect
  440 LDA #&43:STA loc1+1
  450 LDA #&03:STA loc2+1
  460 LDA #&05:STA loc3+1
  470 LDA #&06:STA loc4+1
  480 LDA #&09:STA loc5+1
  490 LDA #&0A:STA loc6+1
  500 LDA #&FF:STA pflag
  510 .redirect
  520 LDA #&00:STA highlights
  530 SEI
  540 LDA #event MOD &100
  550 STA evntv
  560 LDA #event DIV &100
  570 STA evntv+1
  580 LDA #14
  590 LDX #2
  600 JSR osbyte
  610 LDA #14
  620 LDX #6
  630 JSR osbyte
  640 CLI
  650 LDA #4
  660 LDX #2
  670 JSR osbyte
  680 LDA #&15
  690 LDX #0
  700 JSR osbyte
  710 PLA:TAY:PLA:TAX:PLA:PLP
  720 RTS
  730 ]
  740 init_end = P%
  750 P%=&900
  760 [OPT pass%
  770 .event
  780 PHP:PHA
  790 CMP #6
  800 BEQ escape
  810 CMP #2
  820 BEQ key_pressed
  830 CMP #5
  840 BNE not_for_me
  850 JMP restore
  860 .not_for_me
  870 PLA:PLP
  880 .evold
  890 JMP evold
  900 .escape
  910 LDA #&7E
  920 JSR osbyte
  930 LDA #&FF
  940 STA pflag
  950 LDA #&7D
  960 JSR osbyte
  970 JMP not_for_me
```

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COMPILERS

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```
 980 .key_pressed
 990 LDA &80:PHA
1000 LDA &81:PHA
1010 TXA:PHA
1020 TYA:PHA
1030 .test_print
1040 CMP #&00
1050 BEQ init_printer
1060 .test_format
1070 CMP #&06
1080 BNE test_underline
1090 JMP format
1100 .test_underline
1110 CMP #&94
1120 BNE not_underline
1130 STA hflag
1140 JMP return
1150 .init_printer
1160 LDA #&FF
1170 STA pflag
1180 LDX #0
1190 .init_code
1200 LDA #2
1210 JSR oswrch
1220 LDA &CFD
1230 BEQ init_done
1240 LDA #1
1250 JSR oswrch
1260 LDX &CFD
1270 JSR oswrch
1280 LDA &CFE
1290 BEQ init_done
1300 LDA #1
1310 JSR oswrch
1320 LDA &CFE
1330 JSR oswrch
1340 .init_done
1350 LDA #3
1360 JSR oswrch
1370 LDA #7
1380 JSR oswrch
1390 JMP return
1400 .not_underline
1410 CMP #&80
1420 BCC not_highlight
1430 SBC #&2E
1440 PHA
1450 LDA hflag
1460 BEQ no_hflag
1470 LDA #0
1480 STA hflag
1490 LDA #8
1500 JSR oswrch
1510 .loc1
1520 LDA &40:TAY:DEY
1530 PLA
1540 JSR oswrch
1550 .loc2
1560 STA (&02),Y
1570 JMP return
1580 .no_hflag
1590 PLA
1600 JMP return
1610 .not_highlight
1620 LDA #0
1630 STA hflag
1640 JMP return
1650 .format
1660 LDX #0
1670 LDY #0
1680 STY cflag
1690 .loc3
1700 LDA &00:STA &80
1710 .loc4
1720 LDA &01:STA &81
1730 JSR modify
1740 BCC loc5
1750 JMP done
1760 .loc5
1770 LDA &08
1780 STA &80:STA address
1790 .loc6
1800 LDA &09
1810 STA &81:STA address+1
1820 .not_line_end
1830 LDA (&80),Y
1840 CMP #&0D
1850 BEQ line_end
1860 JSR inc_80
1870 JMP not_line_end
1880 .line_end
1890 STY endflag
1900 .loop
1910 STY cflag
1920 JSR modify
1930 BCC end
1940 JMP done
1950 .end
1960 INC endflag
1970 LDA endflag
1980 CMP #&02
1990 BEQ done
2000 JSR inc_80
2010 LDA (&80),Y
2020 CMP #&20
2030 BEQ done
2040 JMP loop
2050 .done
2060 LDA #&00
2070 STA highlights,X
2080 LDA #&8A
2090 LDX #&00
2100 LDY #&80
2110 JSR osbyte
2120 LDY #&97
2130 JSR osbyte
2140 LDY #&35
2150 JSR osbyte
2160 LDA #14
2170 LDX #5
2180 JSR osbyte
2190 LDA #4
2200 LDX #clock MOD 256
2210 LDY #clock DIV 256
2220 JSR osword
2230 JMP return
2240 .modify
2250 LDA (&80),Y
2260 STA tempa
2270 BEQ set_carry
2280 CMP #&80:BEQ set_carry
2290 CMP #&81:BEQ set_carry
2300 CMP #&0D:BEQ clr_carry
2310 JSR save
2320 JSR inc_80
2330 JMP modify
2340 .set_carry
2350 SEC
2360 RTS
2370 .clr_carry
2380 CLC
2390 RTS
2400 .save
2410 LDA cflag
2420 BNE save_it
2430 LDA tempa
2440 CMP #&1C:BEQ save_it
2450 CMP #&1D:BEQ save_it
2460 CMP #&8D:BEQ do_not_save
2470 CMP #&82:BCS save_it
2480 .do_not_save
2490 LDA #0:STA endflag
2500 RTS
2510 .save_it
2520 LDA tempa
2530 STA highlights,X
2540 CMP #&8F
2550 BNE overwrite
2560 LDA cflag
2570 EOR #&01
2580 STA cflag
2590 .overwrite
2600 LDA #&1C
2610 STA (&80),Y
2620 INX
2630 RTS
2640 .restore
2650 LDA &80:PHA
2660 LDA &81:PHA
2670 TXA:PHA
2680 TYA:PHA
2690 LDA #&0D
2700 LDX #&05
2710 JSR osbyte
2720 LDA address   :STA &80
2730 LDA address+1:STA &81
2740 LDY #&00
2750 LDX #&00
2760 LDA highlights,X
2770 BEQ return
2780 .put_back
2790 LDA (&80),Y
2800 CMP #&1C
2810 BNE inc
2820 LDA highlights,X
2830 STA (&80),Y
2840 INX
2850 LDA highlights,X
2860 BNE inc
2870 LDA #0:TAX:STA highlights,X
2880 JMP restored
2890 .inc
2900 JSR inc_80
2910 JMP put_back
2920 .restored
2930 LDA #&8A
2940 LDX #0
2950 LDY #&96
2960 JSR osbyte
2970 LDY #&35
2980 JSR osbyte
2990 JMP return
3000 .inc_80
3010 INC &80
3020 BNE not_256
3030 INC &81
3040 .not_256
3050 RTS
3060 .return
3070 PLA:TAY
3080 PLA:TAX
3090 PLA:STA &81
3100 PLA:STA &80
3110 PLA:PLP
3120 RTS
3130 .sequence
3140 CPX #2
3150 BCC init
3160 BCS next_char
3170 .init
3180 LDX #0:STX total
3190 CMP #32:BNE next_char
3200 RTS
3210 .next_char
3220 CMP #(control+&80):BEQ sequen
ce_end
3230 CMP #&0D :BEQ sequence_end
3240 CMP #ASC"0" :BCC parameter_en
d
3250 CMP #ASC":" :BCS parameter_en
d
3260 INC cflag
3270 SEC
3280 SBC #48
3290 PHA
3300 LDA total:ASL A:PHA:ASL A:ASL
A:STA total
3310 PLA:CLC:ADC total:STA total
3320 PLA:CLC:ADC total:STA total
3330 RTS
3340 .parameter_end
3350 LDX #1:JMP send_it
3360 .sequence_end
3370 LDX #0
3380 .send_it
3390 STX cflag
3400 LDA #1:JSR oswrch
3410 LDA total:JSR oswrch
3420 RTS
3430 .totalEQUB &00
3440 .tempaEQUB &00
3450 .hflagEQUB &00
3460 .endflag EQUB &00
3470 .address EQUD &0000
3480 .clockEQUB &80
3490 EQUD&FFFFFFFF
3500 .highlights EQUB &00
3510 ]
3520 NEXT
3530 event_end = P%
3540 N$="SAVE :0.!kbinit B71 "+STR
$~(init_end)
3550 PRINT 'N$'
3560 OSCLI(N$)
3570 N$="SAVE :0.!keybd 900 "+STR$
~(event_end)
3580 PRINT N$
3590 OSCLI(N$)
3600 END
```

See Compilers, page 126

Listing 1.

```
 10 REM >Bench1
 20 REM Integer Arithmetic
 30 :
 40 REM #TURBO
 50 REM {NOSTACKCHECK}
 60 :
 70 MODE 12
 80 TIME=0
 90 t%=0
100 FOR n%=1 TO 10000
110 d%=n% DIV 42
120 m%=n% MOD 42
130 t%+=(d%*42+m%)
140 NEXT
150 PRINT"Value obtained: ";t%
160 PRINT"Time: ";TIME/100;" secs
"
170 END
```

Listing 2.

```
 10 REM >Bench2
 20 REM FP Arithmetic
 30 :
 40 REM #TURBO
 50 REM {NOSTACKCHECK}
 60 REM {TYPE=DOUBLE}
 70 :
 80 MODE 12
 90 TIME=0
100 t=0
110 FOR n=1 TO 10000
120 d=n/7
130 t+=d*1.5-d
140 NEXT
150 PRINT"Value obtained: ";t
160 PRINT"Time: ";TIME/100;" secs
"
170 END
```

Listing 3.

```
 10 REM >Bench3
 20 REM Trig Test
 30 :
 40 REM #TURBO
 50 REM {NOSTACKCHECK}
 60 REM {TYPE=DOUBLE}
 70 :
 80 MODE 12
 90 TIME=0
100 FOR n=1 TO 10000
110 s=SIN(RAD(n/100))
120 c=COS(RAD(n/100))
130 t=s+c
140 NEXT
150 PRINT"Value obtained: ";t
160 PRINT"Time: ";TIME/100;" secs
"
170 END
```

Listing 4.

```
 10 REM >Bench4
 20 REM FOR NEXT Loops
 30 :
 40 REM #TURBO
 50 REM {NOSTACKCHECK}
 60 :
 70 MODE 12
 80 TIME=0
 90 FOR x%=1 TO 500
100 FOR y%=1 TO 500
110 NEXT
120 NEXT
130 PRINT"Time: ";TIME/100;" secs
"
140 END
```

COMPILERS

Listing 5.

```
 10 REM >Bench5
 20 REM REPEAT UNTIL Loops
 30 :
 40 REM #TURBO
 50 REM {NOSTACKCHECK}
 60 :
 70 MODE 12
 80 TIME=0
 90 x%=0
100 REPEAT
110 x%+=1
120 y%=0
130 REPEAT
140 y%+=1
150 UNTIL y%=500
160 UNTIL x%=500
170 PRINT"Time: ";TIME/100;" secs
"
180 END
```

Listing 6.

```
 10 REM >Bench6
 20 REM WHILE ENDWHILE Loops
 30 :
 40 REM #TURBO
 50 REM {NOSTACKCHECK}
 60 :
 70 MODE 12
 80 TIME=0
 90 x%=0
100 WHILE x%<500
110 x%+=1
120 y%=0
130 WHILE y%<500
140 y%+=1
150 ENDWHILE
160 ENDWHILE
170 PRINT"Time: ";TIME/100;" secs
"
180 END
```

Listing 7.

```
 10 REM >Bench7
 20 REM Recursive PROCs
 30 :
 40 REM #TURBO
 50 REM {NOSTACKCHECK}
 60 :
 70 MODE 12
 80 TIME=0
 90 PROCthing(640,512,512)
100 PRINT"Time: ";TIME/100;" secs
"
110 END
120 :
130 DEF PROCthing(x%,y%,r%)
140 LOCAL x1%,y1%,x2%,y2%
150 IF r%>2 THEN
160   x1%=x%-r%/2
170   x2%=x%+r%/2
180   y1%=y%-r%/2
190   y2%=y%+r%/2
200   PROCthing(x1%,y1%,r%/2)
210   PROCthing(x1%,y2%,r%/2)
220   PROCthing(x2%,y1%,r%/2)
230   PROCthing(x2%,y2%,r%/2)
240 ENDIF
250 ENDPROC
```

Listing 8.

```
 10 REM >Bench8
 20 REM Arrays and Loops
 30 :
 40 REM #TURBO
 50 REM {NOSTACKCHECK}
 60 :
 70 MODE 12
 80 TIME=0
 90 DIM array%(99,99)
100 FOR x%=0 TO 99
110 FOR y%=0 TO 99
120 array%(x%,y%)=1
130 NEXT
140 NEXT
150 PRINT"Time: ";TIME/100;" secs
"
160 END
```

Listing 9.

```
  10 REM >BenchMaze
  20 REM Compiler Test
  30 REM by Dave Acton
  40 REM for Archimedes only
  50 REM (c)BAU November 1989
  60 :
  70 MODE 12
  80 OFF
  90 TIME=0
 100 VDU 28,0,3,79,0
 110 FOR c%=8 TO 15
 120 COLOUR 4,&80,&80,&80
 130 NEXT
 140 sq%=32
 150 across%=1280 DIV sq%
 160 down%=900 DIV sq%
 170 randseed%=123
 180 randxor%=&1D872B41
 190 fix%=FNrnd(-&DCA)
 200 DIM maze%(across%,down%),sear
ch%(across%,down%)
 210 DIM targetx%(9),targety%(9)
 220 PROCbuildmaze
 230 mx%=0
 240 my%=down%-1
 250 mdir%=2
 260 PROCshowpath
 270 FOR target%=0 TO 9
 280 CLS
 290 PRINT"Searching for '";target
%+1;"'"
 300 PROCgoto(targetx%(target%),ta
rgety%(target%))
 310 PROCshowtargets
 320 NEXT
 330 CLS
 340 PRINT"Total time taken: ";TIM
E/100;" seconds"
 350 END
 360 :
 370 DEF PROCgoto(dx%,dy%)
 380 sx%=mx%
 390 sy%=my%
 400 sdir%=0
 410 REM Try the wall beside
 420 WHILE sx%<>dx% OR sy%<>dy%
 430 IF FNcango(sx%,sy%,(sdir%+1)
MOD 4) THEN
 440 sdir%=(sdir%+1) MOD 4
 450 ELSE
 460 IF NOT FNcango(sx%,sy%,sdir%)
 THEN
 470 IF FNcango(sx%,sy%,(sdir%+3)
MOD 4) THEN
 480 sdir%=(sdir%+3) MOD 4
 490 ELSE
 500 sdir%=(sdir%+2) MOD 4
 510 ENDIF
 520 ENDIF
 530 ENDIF
 540 search%(sx%,sy%)=sdir%
 550 CASE sdir% OF
 560 WHEN 0:sy%+=1
 570 WHEN 1:sx%+=1
 580 WHEN 2:sy%-=1
 590 WHEN 3:sx%-=1
 600 ENDCASE
 610 ENDWHILE
 620 WHILE mx%<>dx% OR my%<>dy%
 630 mdir%=search%(mx%,my%)
 640 PROCshowpath
 650 CASE mdir% OF
 660 WHEN 0:my%+=1
 670 WHEN 1:mx%+=1
 680 WHEN 2:my%-=1
 690 WHEN 3:mx%-=1
 700 ENDCASE
 710 ENDWHILE
 720 PROCshowpath
 730 ENDPROC
 740 :
 750 DEF FNcango(x%,y%,d%)
 760 =(maze%(x%,y%) AND (2^d%))=0
 770 :
 780 DEF PROCshowpath
 790 LOCAL ox,oy,ang
 800 GCOL 4
 810 RECTANGLE FILL mx%*sq%,my%*sq
%,sq%-1,sq%-1
 820 GCOL 7
 830 ox=mx%*sq%+sq%/2
 840 oy=my%*sq%+sq%/2
 850 ang=2*PI*(mdir%/4)
 860 MOVE ox+FNs(ang),oy+FNc(ang)
 870 MOVE ox+FNs(ang+2/3*PI),oy+FN
c(ang+2/3*PI)
 880 PLOT 85,ox+FNs(ang+4/3*PI),oy
+FNc(ang+4/3*PI)
 890 PROCshowcell(mx%,my%,4)
 900 PROCshowtargets
 910 ENDPROC
 920 :
 930 DEF FNs(a)=sq%/3*SIN(a)
 940 DEF FNc(a)=sq%/3*COS(a)
 950 :
 960 DEF PROCbuildmaze
 970 FOR x%=0 TO across%-1
 980 FOR y%=0 TO down%-1
 990 maze%(x%,y%)=%1111
1000 NEXT
1010 NEXT
1020 lefttodo%=across%*down%
1030 fx%=0
1040 fy%=0
1050 PROCknockdownwall(FNrnd(acros
s%-2),FNrnd(down%-2),FNrnd(4)-1)
1060 WHILE lefttodo%>0
1070 PROCfindaplace(curx%,cury%)
1080 REPEAT
1090 ok%=FALSE
1100 tries%=0
1110 REPEAT
1120 dir%=FNrnd(4)-1
1130 CASE dir% OF
1140 WHEN 0:
1150 IF cury%<down%-1 THEN
1160 IF maze%(curx%,cury%+1)=%1111
 THEN
1170 PROCknockdownwall(curx%,cury%
,0)
1180 cury%+=1
1190 ok%=TRUE
1200 ENDIF
1210 ENDIF
1220 WHEN 1:
1230 IF curx%<across%-1 THEN
1240 IF maze%(curx%+1,cury%)=%1111
 THEN
1250 PROCknockdownwall(curx%,cury%
,1)
1260 curx%+=1
1270 ok%=TRUE
1280 ENDIF
1290 ENDIF
1300 WHEN 2:
1310 IF cury%>0 THEN
1320 IF maze%(curx%,cury%-1)=%1111
 THEN
1330 PROCknockdownwall(curx%,cury%
,2)
1340 cury%-=1
1350 ok%=TRUE
1360 ENDIF
1370 ENDIF
1380 WHEN 3:
1390 IF curx%>0 THEN
1400 IF maze%(curx%-1,cury%)=%1111
 THEN
1410 PROCknockdownwall(curx%,cury%
,3)
1420 curx%-=1
1430 ok%=TRUE
1440 ENDIF
1450 ENDIF
1460 ENDCASE
1470 IF NOT ok% tries%+=1
1480 UNTIL tries%>4 OR ok%
1490 UNTIL tries%>4
1500 ENDWHILE
1510 FOR i%=0 TO 9
1520 targetx%(i%)=FNrnd(across%)-1
1530 targety%(i%)=FNrnd(down%)-1
1540 NEXT
1550 PROCshowtargets
1560 ENDPROC
1570 :
1580 DEF PROCshowtargets
1590 GCOL 1
1600 FOR i%=0 TO 9
1610 x%=sq%*targetx%(i%)+sq%/2
1620 y%=sq%*targety%(i%)+sq%/2
1630 CIRCLE FILL x%,y%,sq%/4
1640 NEXT
1650 ENDPROC
1660 :
1670 DEF PROCfindaplace(RETURN x%,
RETURN y%)
1680 REPEAT
1690 fx%=(fx%+1) MOD across%
1700 IF fx%=0 fy%=(fy%+1) MOD down
%
1710 UNTIL maze%(fx%,fy%)<>%1111
1720 x%=fx%
1730 y%=fy%
1740 ENDPROC
1750 :
1760 DEF PROCknockdownwall(x%,y%,s
%)
1770 PROCclear(x%,y%,s%)
1780 CASE s% OF
1790 WHEN 0:IF y%<down%-1 PROCclea
r(x%,y%+1,2)
1800 WHEN 1:IF x%<across%-1 PROCcl
ear(x%+1,y%,3)
1810 WHEN 2:IF y%>0 PROCclear(x%,y
%-1,0)
1820 WHEN 3:IF x%>0 PROCclear(x%-1
,y%,1)
1830 ENDCASE
1840 ENDPROC
1850 :
1860 DEF PROCclear(x%,y%,b%)
1870 IF maze%(x%,y%)=%1111 THEN le
fttodo%-=1
1880 maze%(x%,y%)=maze%(x%,y%) AND
 (NOT (2^b%))
1890 PROCshowcell(x%,y%,0)
1900 ENDPROC
1910 :
1920 DEF PROCshowcell(x%,y%,c%)
1930 ox%=sq%*x%
1940 oy%=sq%*y%
1950 IF (maze%(x%,y%) AND 1)>0 GCO
L 7 ELSE GCOL c%
1960 LINE ox%,oy%+sq%-1,ox%+sq%-1,
oy%+sq%-1
1970 IF (maze%(x%,y%) AND 2)>0 GCO
L 7 ELSE GCOL c%
1980 LINE ox%+sq%-1,oy%,ox%+sq%-1,
oy%+sq%-1
1990 IF (maze%(x%,y%) AND 4)>0 GCO
L 7 ELSE GCOL c%
2000 LINE ox%,oy%,ox%+sq%-1,oy%
2010 IF (maze%(x%,y%) AND 8)>0 GCO
L 7 ELSE GCOL c%
2020 LINE ox%,oy%,ox%,oy%+sq%-1
2030 ENDPROC
2040 :
2050 DEF FNrnd(range%)
2060 LOCAL i%,cs%
2070 FOR i%=1 TO 32
2080 cs%=randseed% AND 1
2090 randseed%=randseed%>>1
2100 IF cs%=1 randseed%=randseed%
EOR randxor%
2110 NEXT
2120 =1+(randseed% AND &FFFF) MOD
range%
```

Listing 10–13.

```
 10 REM >Fail1
 20 REM Won't compile using eithe
r
 30 :
 40 PRINT EVAL("2+2")
 50 END

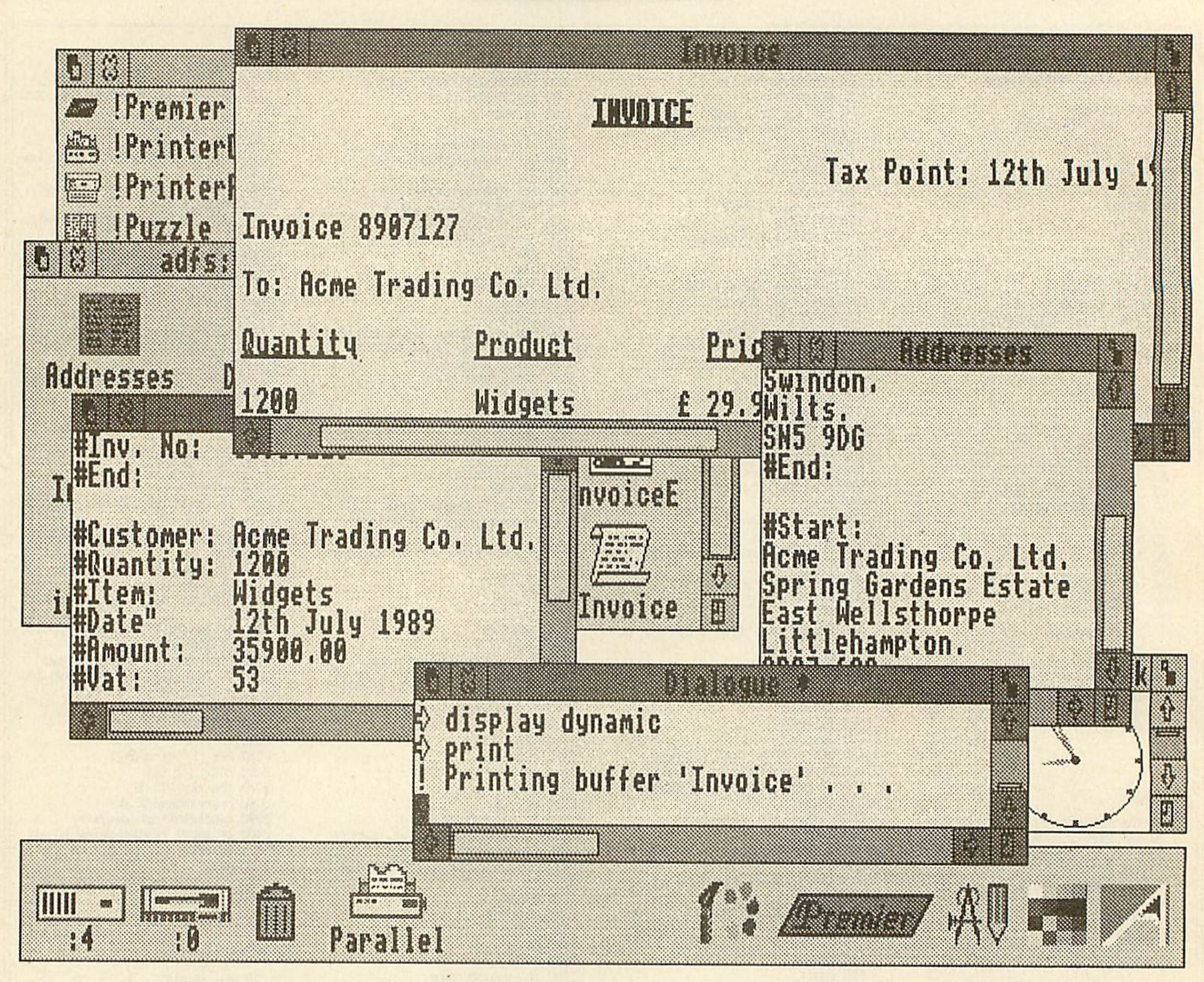
 10 REM >Fail2
 20 REM Won't compile using RiscB
asic
 30 :
 40 DIM q% &100
 50 $q%=FNstr(42)
 60 PRINT($q%)
 70 END
 80 :
 90 DEF FNstr(x%)
100 =FNstr2(x%)
110 :
120 DEF FNstr2(x%)
130 ="Hello"

 10 REM >Fail3
 20 REM Won't compile using ABC
 30 :
 40 DIM a%(100)
 50 a%()=1
 60 END

 10 REM >Fail4
 20 REM Won't work with either
 30 :
 40 DIM q% 4
 50 PROCshow(42)
 60 END
 70 :
 80 DEF PROCshow(!q%)
 90 PRINT"Value is: ";!q%
100 ENDPROC
```

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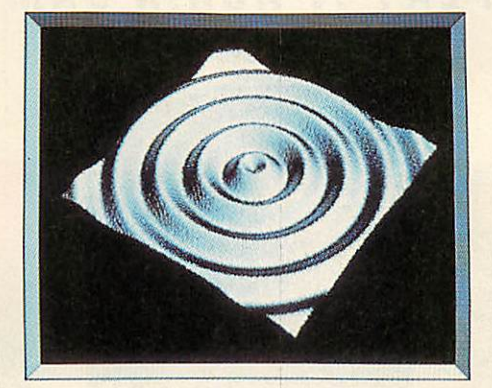
OFFERS

THIS MONTH'S LISTINGS

The November disc is positively bulging with goodies so you have absolutely really truly no excuse for not buying it!

This month's cover feature does not involve anything strenuous, just sit back and watch the dazzling display of pyrotechnics unfold before you!

If you are more of a programmer, then check out Hints and Tips, there you will find routines to emulate LISTIF in Basic 1 and 2, a duplicate label checker, an OS vector list and most useful, a utility to recover programs from a corrupted DFS disc.



For the Archie user, Agora deals with various calendar functions, including day of the week and time between days. There is also a demonstration of text scaling with Risc OS and another look at prime numbers.

For the more artistic, why not design some posters with the poster designer?

Finally, we present the ultimate *View* printer driver for your enjoyment.

Set your micro on fire

GAMES DISC

Ten of the best *Acorn User* games on one 80-track double-sided 5.25-inch disc.

Whether you're into arcade or adventure type games this new disc has something for everyone. The games included are *Warlord, Wizalon, Castle of Nightmares, Run Silent, Run Deep, Polyominoes* and *Quadline*. We have also included three of the most popular one-line games from recent Abusers. Test your knowledge with *Mastermind* and start playing *Varpon* and *Lurch* to win.

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The programs on the Archimedes version of the disc include: Arc-beeb transfer; an introduction to Arc windows; the world's fastest mandelbrots; an Arc version of the famous *Life* program; graphic special effects, In-betweening; an Arc screendump; screen compacter/decompacter; Mouse pointer editor; Arc ADFS file locator; PC and ST disc reader. Plus several of the graphics bonuses from 1988. At £8.95 this disc is a real bargain.



BBC, Master and Compact owners

Included on the 5.25in and 3.5in Master Compact version are the following programs: *Wizalon,* the bouncing wizards game; AutoROM; our *Micro Sherlock* intelligence test; Joe's introduction to spreadsheets; Bezier Curves; Microspacing and justifying for *View; Polyominoes,* and *Imagen,* the adventure creator, plus the best in graphics from 1988.

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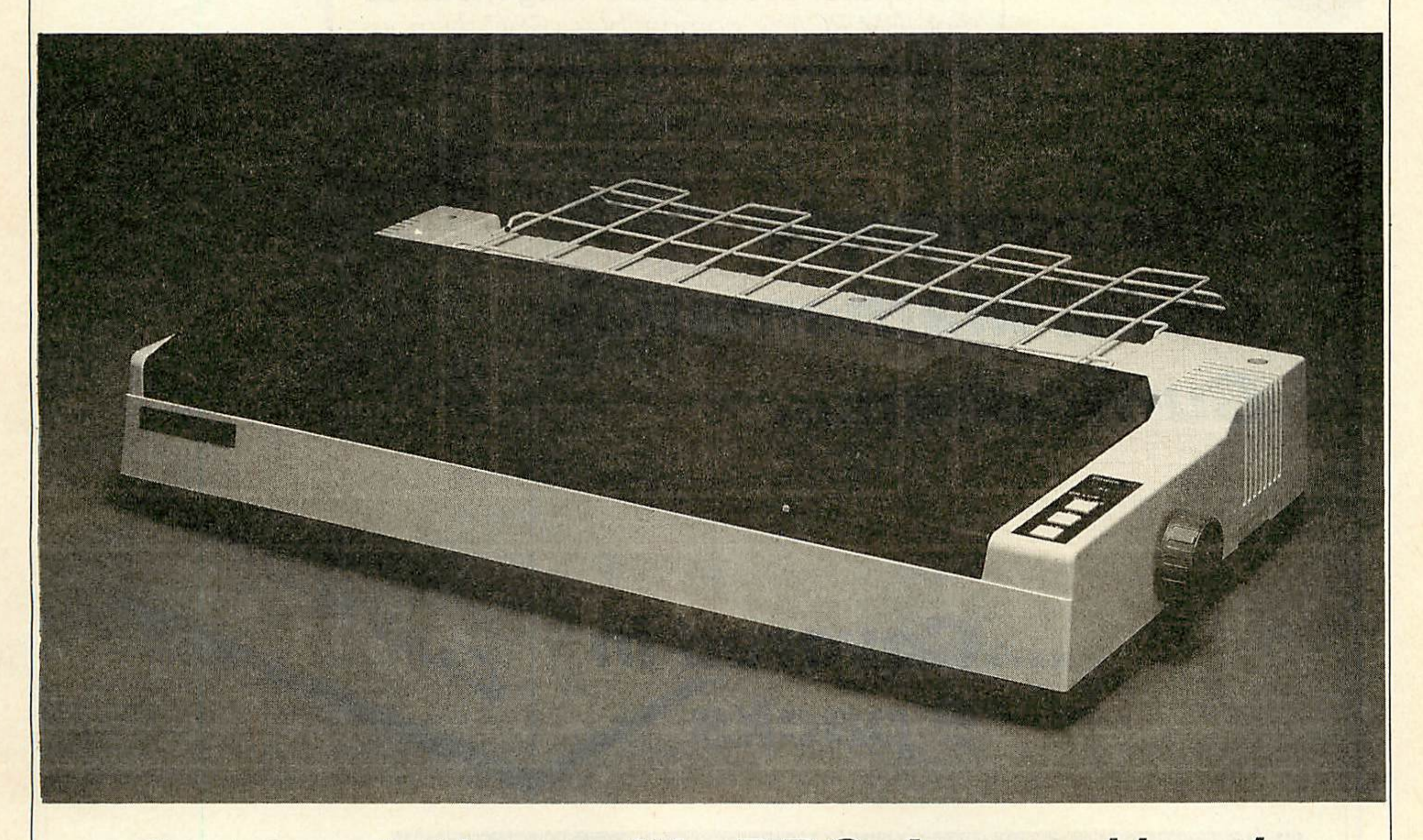
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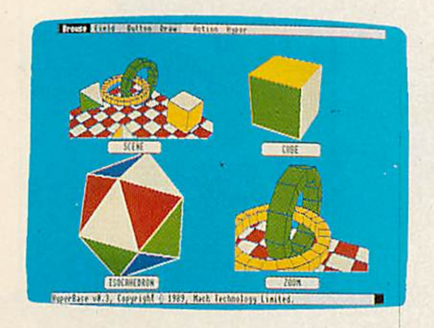
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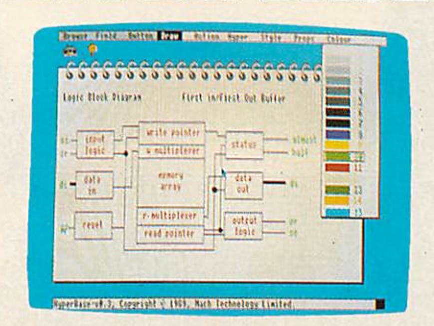
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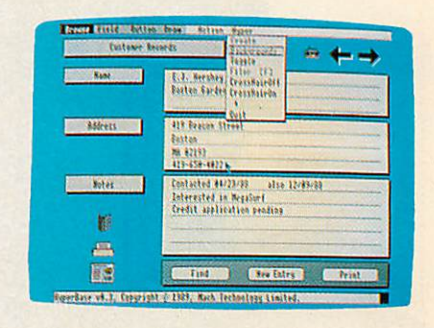
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TESTING OUT THE BUNCH OF FIVE

Malcolm Brown got hold of five 24-pin printers and lets us know what to expect

Any choice of printer is going to be a compromise. There is no perfect model or even a perfect type. Each method of printing has its problems and benefits.

The most important factor is the quality of print and although the best possible print comes from daisywheel printers these have many disadvantages, not least their lack of versatility and speed. Daisywheel printers can take as long as five minutes to print just one page.

A laser printer provides the best of most worlds for most users – they are fast and produce print almost as good as a daisywheel. However, they are expensive, both to buy and to run.

The best compromise for most users is a dot-matrix printer and 24-pin models provide the best deal of all.

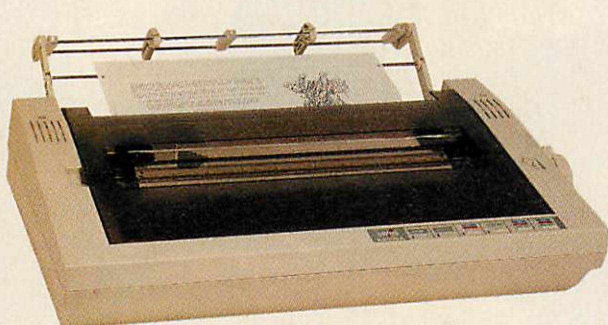
There is now a large range of prices of 24-pin machines to choose from. The cheapest are less than £400 and the most expensive anything up to £2000.

Printing speed is the main difference between models of different price but many other factors such as quality of construction, paper handling and typefaces also affect the cost.

Manufacturers quote the speeds of their machines in characters per second (CPS) but these are all too often optimistic figures and not representative of realistic everyday use.

All these printers have been tested printing the same document to provide results which are more realistic.

A printer will always be faster printing in draft mode than in NLQ so if you intend to use your printer mostly for program listings and rough work, it is the draft speed you should study closest. If the printer is mainly for letters or reports, the NLQ speed is more important.



Cheap and adequate

Latest style

A big attraction of dot-matrix printers is their versatility. The ability to print text underlined, enboldened, in superscript or subscript, in italics and in different character sizes can mean the difference between just another boring letter and a really eye-catching document.

Most dot-matrix printers these days can produce all these effects and some also offer a choice of entirely different character styles so your printouts could, like this magazine, be in an attractive, readable typeface with small parts printed in contrasting plain characters.

All the printing effects, switching fonts, and even the design of new fonts or graphics are controlled with codes from the computer according to several code standards used by different manufacturers. By far the most common are those used by Epson and IBM. These are very similar, the main difference being that earlier Epson machines ('FX' types) could not produce as many accented letters, special symbols and block graphics as the early IBM standard, (IBM Graphics printer) but could manage more printing effects. The two more recent standards (Epson LQ and IBM Proprinter) are far closer in their capabilities but still differ in a few respects.

Most BBC micro software assumes Epson FX emulation is available. Archimedes software tends to require the full IBM character set of both Epson LQ and IBM emulations.

The printer's controls are used initially to set up your printer to suit you and your computer, to alter printing quickly without using the computer and to switch on or off effects or font changes which your software cannot instigate with control codes. The more comprehensive the controls the better, although they should also be easy to operate and understand.

Paper work

Just about all printers have friction feed mechanisms for single sheets and most offer automatic paper loading for these. Bulk sheet feeders are often available as extras.

Most printers include a tractor feed unit for fanfold paper. Tractor units either push the paper through the machine – usually the best method with no wasted paper – or pull it through (better for bulky envelopes and multipart forms but wasteful). The best, of course, is a tractor unit which can either push or pull the paper and a few models offer this.

Amstrad LQ5000di

♥♦♣♠!"#$%&'()*+,-./01
23456789:;<=>?@ABCDEF
GHIJKLMNOPQRSTUVWXYZ[

At around £449, this is cheap for a wide carriage printer, and a fast one at that. The LQ5000di can print in draft mode at 119CPS – faster than some machines costing twice as much – and at 48CPS in NLQ mode.

The print quality in draft mode is pretty awful. However, it is just about legible and that's all that is required. In NLQ mode the print is a little ragged but dark and even and nicely formed.

The LQ5000di is compatible with both Epson LQ and IBM Proprinter standards, although the choice between them can only be selected with fiddly Dip switches at the rear of the machine.

The front panel is easy to use and offers a good basic level of control. The automatic paper loading is equally good and rarely feeds the paper crooked.

However, the price of this machine

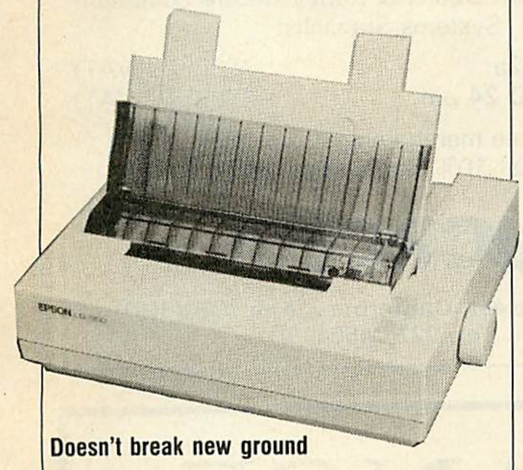
shows clearly in its construction. It is extremely flimsy and the plastic covers and guides have badly finished edges.

However, it is cheap and as far as features go, the LQ5000di is well equipped. There is no other wide carriage 24-pin printer which can match these speeds at this price.

Epson LQ-850

```
!"£$%&'()*+,-./01
23456789:;<=>?@ABCDEF
GHIJKLMNOPQRSTUVWXYZ[
ROMAN      SANS SERIF
```

The LQ-850 is Epson's mid-range 24-pin printer and is in fact an updated version


Doesn't break new ground

of the earlier LQ-800 – one of Epson's first 24-pin machines.

All Epson printers are popular enough to be stocked by the majority of dealers and this model can often be found discounted by as much as £250. Although only an 80-column printer (the wide carriage LQ-1050 costs £976), the LQ-850 is large. Unless it's used with a printer stand, it takes over the desk.

It's finished off in Epson's standard Acorn-matching cream coloured plastic but inside the LQ-850 has a strong metal chassis which should ensure it stands up to the rough and tumble for a long time.

This model has both Centronics parallel and RS232 serial interfaces as standard and the RS232 interface even uses a Din socket just like the Beeb.

The tractor feed unit is a push feed type which will suit most users. If you intend to use a lot of envelopes or carbon copies, an optional pull tractor unit will cost you another £75.

The automatic paper loading is a little tricky to get used to as the trigger button doubles as the form feed. If you try to load a sheet when the printer doesn't 'know' it is out of paper, it's pushed right through the machine back out at you – but without raising the bail bar so it gets torn to shreds in the process.

The LQ-850 is a fast machine for the price. Epson quotes a speed of 220CPS in draft mode and 73CPS in NLQ mode. In fact the LQ-850 manages about 136CPS and 57CPS, respectively.

The quality of print is also good. The draft is clear enough, the NLQ characters well designed and fine and sharp.

However, the NLQ lacks a little in weight, even with the machine set to print at its darkest.

There are two NLQ typefaces – the usual typewriter look-alike and a plain style. More can be added as plug-in cartridges (two at a time) for £63 each.

The font used can be selected with control codes from the computer or from the front panel. The controls (with the exception of the load/eject button) are particularly clear and simple.

The LQ-850 is Epson LQ compatible but IBM compatibility is not provided. This is unlikely to worry many readers unless they're using a Master 512 or an Arc emulating a PC.

The LQ-850 does not break any new ground for special features. However, it is well made, sensibly designed and performs well with everything you could expect from a printer of this price.

Star LC24-10

```
♥♦♣♠!"#$%&'()*+,-./01
23456789:;<=>?@ABCDEF
GHIJKLMNOPQRSTUVWXYZ[
COURIER PRESTIGE
SCRIPT  ORATOR
```

As the 24-pin version of the excellent 8-pin LC-10, a lot is expected of the LC24-10. Unfortunately this model does not



Good value, but slow

stand out from the crowd in the same way. Although the price is low, the LC24-10 is not cheaply made. It is largely plastic but solid enough.

However, this is one of the slower 24-pin printers around. It can manage 36CPS in NLQ mode and in draft mode it will print at 90CPS.

The LC24-10 has a push tractor feed fitted and has automatic paper loading to make using cut sheet paper easier. It is reasonably quiet – surprisingly so for such a plastic machine.

The print quality is good but the characters are a little faint, even with a new ribbon fitted. The real attraction of the LC24-10 is the choice of four NLQ character styles.

As well as the standard typewriter look-alike 'Courier' style there is slightly different 'Prestige' style, a plain modern-looking 'Orator' and a 'Script' style.

It is difficult not to be reasonably creative with that lot at your fingertips and in case that's not enough, further styles can be added with smart plug-in card cartridges for £56 each.

The LC24-10 is both Epson LQ and IBM Proprinter compatible and uses a comprehensive, if somewhat confusing front panel to make control of all the important bits accessible if necessary.

There are not enough buttons and lights on the control panel to make it immediately obvious what you're doing. It shouldn't be necessary to learn from the manual how to change character style or pitch. As it is, you have to listen for the right number of beeps to know which mode it's in before selection, otherwise you end up with, say, the wrong style in quiet mode by mistake and have a very slow printer on your hands.

However, once mastered, the LC24-10 is certainly value for money. It is not a top flight printer but it has all the necessary features and a few extra.

Seikosha SP-130AI

```
♥♦♣♠!"#$%&'()*+,-./01
23456789:;<=>?@ABCDEF
GHIJKLMNOPQRSTUVWXYZ[
COURIER   PRESTIGE
ORACLE    OCR
BOLDFACE  GOTHIC
LIGHT ITALIC
```

The SL-130AI is at the top of the price range for 24-pin printers. One reason for this is that it is a wide carriage printer, able to print across 16in wide paper.

This printer is quite heavy and has a substantial metal chassis inside but the overall impression is not of strength. The plastic panels bow and the acrylic covers

PRINTER COMPARISONS

Make & Model	Price (+VAT)	Print width	Claimed speed (draft)	(NLQ)	Average Speed (draft)	(NLQ)	Interface Centr.	RS232	Sheet Feeder	Auto Load	Emulations Epson	IBM	Built-in fonts	Plug-in fonts
Amstrad LQ5000di	£449	136	240	80	119	48	•	•		•	•	•	1	
Epson LQ-850	£659	80	220	73	136	57	•	•	£165	•	•		2	£55
NEC P6 Plus	£649	80	220	75	130	56	•	£85	£125	•	•		6	£45
Seikosha SL-130AI	£725	136	180	60	93	49	•		£136	•	•	•	7	
Star LC24-10	£399	80	142	47	90	36	•		£65	•	•	•	4	£49

and paper guides are not built to last.

A push feed tractor is provided and at the end of a document printed on fanfold paper, two of the front panel buttons are pressed together to feed the page clear of the machine for tearing off the paper and a further press of the buttons feed the



Not built to last

paper back into the machine to the top of the page with neither waste nor effort.

The SL-130AI also 'parks' the fanfold paper when switching to friction feed for cut sheets. Automatic paper loading is provided but occasionally this snags and the sheet is fed crooked and creased.

Unlike most Seikosha Printers, the SL-130AI is not that fast. It manages about 93CPS in draft mode and 49CPS printing NLQ. The draft speed is particularly slow for a printer of this price. NLQ printing is a little better, but the quality of NLQ print spoils any chances of the SL-130AI being bought for NLQ alone.

The NLQ characters are not much better than many 9-pin printers produce, and at this speed not much faster either.

However, the SL-130AI can produce seven different NLQ typestyles as standard, ranging from the normal typewriter look-alike to a boldface font and a light italic style. Only the dubiously useful Script face is missing.

The SL-130AI is Epson LQ and IBM Graphics printer compatible. The absence of full IBM Proprinter emulation won't be missed but italics cannot be printed in IBM mode (without switching to the light italic typeface).

The typeface and character pitch are selected from the front panel. This could do with some more buttons to avoid too many functions on each.

The SL-130AI uses no Dip switches but uses a printed setup menu system. This covers almost every aspect of the printer and the details are stored in non-volatile memory, always there when the printer is turned on.

The SL-130AI is a bit of a disappointment. For this price a faster speed, better quality or more rugged construction would be expected.

NEC Pinwriter P6 Plus

```
♥♦♣♠!"£$%&'()*+,-./01
23456789:;<=>?@ABCDEF
GHIJKLMNOPQRSTUVWXYZ[
COURIER    PRESTIGE ELITE
SOUVENIR   HELVETTE PS
BOLDFACE PS
```

The P6 Plus is an updated model of NEC's older P6 but it has been changed considerably – for the better.

This is an 80-column machine built with as few breakable frills and decorative bits as possible, ensuring it a long life.

As well as a solid construction, a lot of attention has been paid to sound proofing the P6 Plus. Not only is the casing of the printer lined with foam but a special sound deadening mat is provided with the printer to sit it on.

There is the usual 'quiet printing' function to be found on most printers. In fact, this just slows down the printing – it's quieter but it just takes longer instead.

Like many of the more expensive 24-pin machines, the P6 Plus has no Dip switches. It uses non-volatile memory inside to store all the set-up parameters and these are altered with a printed menu, the front panel buttons for response and the two digit LED display for further prompting.

The front panel is also used to select printing from draft, the six NLQ styles built-in or further styles available on 'smart cards' to be plugged into the front of the machine.

The pitch of the characters can also be controlled from the front panel but most of the NLQ styles can only be printed



Expensive, but worth it

proportionally spaced and so no pitch control is possible.

The P6 Plus uses only the Epson LQ control codes but this means it can manage the whole IBM extended character set so it will lose few Acorn friends for that reason. This machine's biggest asset is its speed. Despite its mid-range price, NEC claims it will print at 220CPS in draft mode and 75CPS in NLQ mode. Printing the standard document it managed a healthy 130CPS in draft mode and 56CPS in NLQ mode – about 50 seconds for a normal A4 sheet of text.

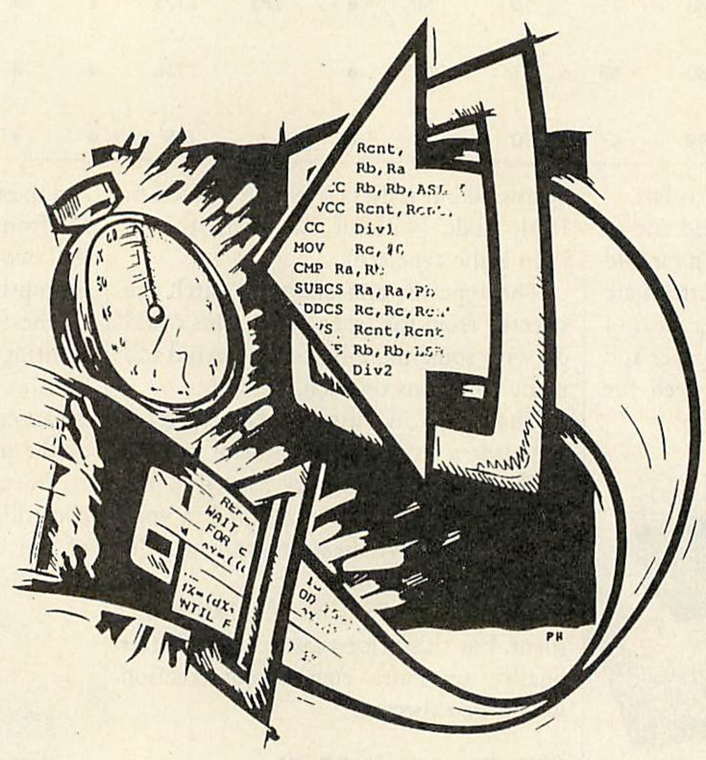
An efficient push tractor feed is built-in but the one drawback of the paper handling is the automatic paper loading. The P6 Plus is an excellent machine. It's a little on the expensive side but if the budget can run to it, it won't disappoint.

Next month Malcolm Brown will look at a further selection of 24-pin printers and present a comprehensive comparison table of all the models looked at in BAU.

BASIC ON SPEED

While testing out two Basic Compilers for the Arc, Dave Acton puts you in an amazing predicament

It's now quite a while since the first Basic compiler for the Arc came out – the original *ABC* from Dabs Press. Now, we have a choice – *Riscbasic* from Silicon Vision and *ABC2*, the updated version of Dabs' original product. Contrary to expectations, both compilers produced some very impressive results. Both packages do essentially the same job, taking programs written in Basic V and converting them into fast Arm code which behaves exactly as the original Basic. This is no mean task, since Basic was designed only to be interpreted and never compiled. So it is fair to say both compilers have their limitations.





The front end

Both *ABC2* and *Riscbasic* are Risc OS compatible and I've used the Risc OS desktop environment throughout these trials. However, I should point out that of the five 'fixed' versions of *Riscbasic* I've received over the past few weeks, only the most recent (1.97) works satisfactorily with Risc OS. It's taken a while, but Silicon Vision has finally got the front end sorted out!

Having said that, *Riscbasic* does provide more control over the compilation process from the desktop than *ABC2* but *ABC2* is more consistent with the rest of the desktop – for example, you can save your compiled code by dragging an icon to a directory whereas *Riscbasic* requires pathnames to be set.

The results

The most important question is how well the compilers compile? There are several criteria by which to judge their performance. The first is their speed.

Speed improvement varies considerably from test to test but I was impressed by the performances of both compilers.

Rather than use the benchmarks supplied with the compilers, I've knocked up eight of my own to preserve the independence of this review (see the yellow pages). Benchmarks are fairly standard so I'm willing to say my results are fairly representative.

The exact timings are shown in table 1. Each test begins with MODE 12 (to avoid the slowing-down effect caused by higher resolution display modes) and the Basic, *Riscbasic* and *ABC2* versions were all run from the desktop. There are, however, several points to note.

First, you'll notice some compiler 'directives' at the start of the programs. These are instructions. *Riscbasic* directives begin with # whereas *ABC2* expects them in curly brackets. The {NOSTACKCHECK} command speeds up the *ABC2* code by telling it not to worry about running out of stack memory. *Riscbasic* doesn't check this by default but can be forced to do so with #STACKCHECK. The #TURBO command speeds up *Riscbasic* code for programs where each FOR has only one corresponding NEXT.

Both compilers show a marked improvement on Basic in almost all of the tests. The exceptions are floating-point and trigonometry which are dealt with using the floating-point emulator. In these cases, Basic outpaces the compiled versions by a sizeable factor!

ABC2 scores highly in the integer arithmetic and the FOR...NEXT loops. Further tests reveal its success in the latter is down to the compiler ignoring empty FOR...NEXT loops completely. If you stick a single instruction (say a% = 4) in the middle of the loops, *Riscbasic* wins the race.

Riscbasic does particularly well in the REPEAT...UNTIL and WHILE...ENDWHILE tests. The #TURBO directive helps in this but I should point out it does seem this directive was designed purely for benchmark tests, although it is useful for short and simple programs or parts of longer ones. The other area *Riscbasic* scores highly in is that of arrays.

However, benchmarks are a bit misleading. As a rule, they are not representative of the performance of compilers fed with 'real' programs. To provide a more realistic picture of how well the compilers perform, I wrote a longer Basic program that includes many features of the benchmarks (loops of all kinds, integer and floating point arithmetic, trigonometry and procedures).

The program *Benchmaze* can be found on the yellow pages and it contains the sort of mixture of Basic commands you might find in an 'average' program.

It simply creates a random maze, deposits 10 'targets' within it and then searches for a path from one to another in sequence. The random sequence is 'seeded' so the original and two compiled versions all use the same 'random' maze.

At first, I compiled *Benchmaze* with

ILLUSTRATION COURTESY OF SILICON VISION

both packages using no directives at all. Basic took 257.18 seconds, *Riscbasic* took 46.62 and *ABC2* took 56.56. I was frankly surprised at how well they both did.

By using directives I managed to get the *Riscbasic* time down to 40.96 seconds and the *ABC2* time down to 47.46. Both compilers do a pretty good job although *Riscbasic* has the edge overall.

The next question is 'how big is the code?' The size of the compiled code is invariably much larger than the original using *Riscbasic*. *ABC2* produces much more compact code, shorter than the original in the case of large Basic programs. The diagram shows how the compilers perform in terms of object size. The bars indicate how many times the object code is larger than the original Basic in each case.

For short programs (such as the benchmarks) the increase in size is massive. This is fair enough, since a sizeable lump of code is appended to the compiled program irrespective of the size of the source. You'll notice that the *Benchmaze* program is compiled much more efficiently and in general, the longer the program, the better the compilers will do.

It is clear *ABC2* produces much tighter code than *Riscbasic*, because library routines are held in a module rather than tacked onto the end of the object file. Code size is not particularly important until you consider writing large programs (such as Risc OS applications) using compiled Basic.

The final question is 'will it work at all?' Not all features of Basic are supported by the compilers and, in general, *ABC2* supports fewer than *Riscbasic*.

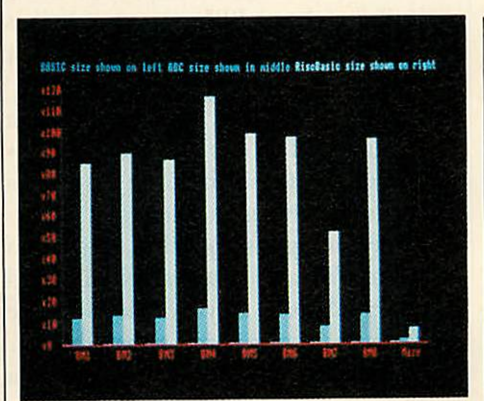
Neither compiler will cope with the EVAL instruction, which is understandable because it is so much an interpreter-specific command. However, *ABC2* has some further limitations.

None of the new matrix-handling facilities are supported by *ABC2*. This wouldn't be too annoying, but even a simple command like flags() = TRUE is rejected, which means you have to add a loop to your program to make it compilable. Another annoying aspect of *ABC2* regards local variables.

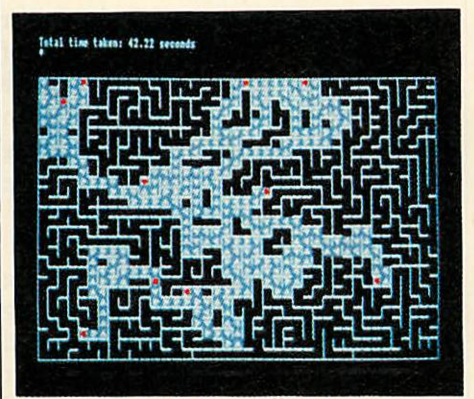
As far as Basic V is concerned, when a variable is declared in a LOCAL statement its local value applies not only in that procedure but also in procedures that are subsequently called. *Riscbasic* handles this correctly but *ABC2* will get the answer wrong because it treats local variables as local in the strictest sense.

Benchmark	Basic	Riscbasic	ABC2
1 - Integer Arithmetic	3.53	0.84	0.46
2 - FP Arithmetic	3.42	6.42	6.05
3 - Trigonometry	11.09	31.35	31.14
4 - FOR...NEXT	4.35	0.27	0.02
5 - REPEAT...UNTIL	29.67	0.28	4.58
6 - WHILE...ENDWHILE	30.07	0.32	4.59
7 - Recursive PROCs	66.18	32.27	33.79
8 - Arrays	1.22	0.08	0.47

Table 1. Comparative timings of the benchmark tests. Later versions of Riscbasic improve a little on these results



Comparing size of compiler programs



Benchmaze – in the yellow pages

In fact, this is quite sensible as far as compilers go. The language C behaves like this and it means much faster object code can be produced. However, if you want to compile an existing Basic program without changing it, this feature of *ABC2* means *Riscbasic* is more likely to provide the correct results.

On the yellow pages are four example programs ('Fail1' – 'Fail4') which give the compilers some problems. By the way, if you think 'Fail2' is a little contrived, it's actually a simplified version of a real program I tried to compile. It took me a long time to find where *Riscbasic* was getting confused.

Other features

Both packages provide other features, including the ability to compile programs into relocatable modules. *Riscbasic* also provides a cross-referencer which gives a description of where it has stored your variables in the object file.

ABC2 also has a cross-referencer but you'll have to buy this separately as part of the *ABX* pack. This pack also contains a profiler (which tells you which bits of your program are used the most) and a facility for building up libraries of Basic procedures in modules – although *Riscbasic* contains this as standard.

Conclusions

In short, both compilers do a great job. Which to buy rather depends on what you want to do. If your interest is in compiling existing Basic programs or you wish to compile programs by making the minimum number of changes to them beforehand, *Riscbasic* offers a great deal, particularly if your the programs you write are short.

If however, you wish to compile longer programs (for example, Risc OS applications) I would recommend *ABC2* with the *ABX* extension pack. Producing more compact code, this seems to be maybe more suited to 'serious' use.

You will, though, have to acknowledge the limitations of *ABC2* throughout the development process. It's not enough just to write your Basic program and hope it will compile at the end!

Either way, I will be hanging on to my review copies of each package. With a bit of luck, they might just help those critics of Basic to realise that it's just about the best language around.

ABC2 *costs £99.95 from Dabs Press, 5 Victoria Lane, Whitefield, Manchester M25 6AL. Tel: 061-766 8423*
Riscbasic *costs £99.95 from Silicon Vision, Signal House, Lyon Road, Harrow HA1 2AG. Tel: 01-422 2274*

APING AUNTIE

Dave Futcher watches a selection of micros line up to the Beeb

The end of the 8-bit BBC micro era is at hand and schools with a large stock of BBC micros are being faced with a problem, what to do with an aging machine.

Their trusty BBC model Bs have ceased production. The replacement, the Master 128, surely has a limited life span.

Other more powerful machines are now available and many schools and LEAs have opted for the increased power offered by a range of new 16 and 32-bit computers available.

Deserting the BBC 'standard' is not an easy decision. A considerable number of schools have large funds in the purchase of BBC micro software and a large amount of time has been spent developing the use of this software across the whole curriculum.

Is this to be simply abandoned?

Although the Archimedes offers new generation power and compatibility with the old, many schools have already bought other machines – RM Nimbus, IBM PC compatibles, the Atari ST, Commodore Amiga and even the Apple Macintosh.

Schools now find themselves in a great dilemma. They want to provide children with the most powerful computer systems for the 1990s but they don't want to sacrifice the enormous software base that is available to them.

By the end of 1987 the National Council for Educational Technology began to investigate BBC emulation and the compatibility of classroom software packages on a range of machines. Emulation was seen as the way forward.

There had already been moves in this direction in the business world with an IBM PC emulator on the Macintosh and indeed the Arc PC emulator too. More importantly, the Arc came supplied with a BBC micro emulator.

One possible route to compatibility, and the saving of enormous development costs, is BBC emulation and/or versions of the all-important BBC Basic for 16 and 32-bit machines.

When the Archimedes was first released it was provided with a module called *65Arthur* which allowed you to run some of the existing BBC based software packages on the Archimedes.

Now that Arthur is dead, Risc OS is provided with two BBC micro emulations which are an improvement on this first offering as a good many packages run.

The first is *65Tube*, which emulates a BBC micro with a 6502 second processor attached. For the many 6502 Language Rom images this is excellent.

Some packages supporting 80 column text like *View* and *Viewsheet* are enhanced by the emulator as they are able to use the Archimedes, 132 column screen display.

It's worth noting the double Rom systems used for Acornsoft Logo and Iso-Pascal cannot be used.

65Tube is not so good for other software. Only around 70 per cent of programs will run properly – only those which exactly follow the Acorn rules on screen and file handling. It is amazing how many programs actually break these rules with 'illegal' programming.

A far better bet is *65Host*. This substantially emulates a BBC model B running the 1.20 operating system supporting paged sideways Roms. Unlike the old *65Arthur* and *65Tube*, it supports direct screen access and a number of 'illegally' written packages will run without any major problems.

With this emulator running in your Archimedes you will enjoy compatibility with a large range of BBC micro software.

There are however minor problems in getting your 5.25in DFS based software ready for the Archimedes ADFS which uses 3.5in discs. Two products from Beebug solve this.

The *Serial Link Kit* enables files to be transferred between the two machines with the minimum of fuss using the serial ports. The *DFS Reader for the Archimedes* used in conjunction with a 5.25in disc drive transfers files quickly between DFS discs and ADFS ones.

The IBM PC

The RM Nimbus

Oxford based Research Machines, always second to Acorn in education, was certainly first to leave 8-bit behind for the world of 16-bit. A number of the LEAs which had steered away from Acorn were concerned, however, about the software base they were leaving behind.

Research Machines was quick to see the advantages of marketing a version of BBC Basic for the Nimbus and the result was *Nimbus PC BBC Basic (86)*.

As well as a full implementation of BBC Basic this has built-in facilities that emulate the screen, keyboard and other interfaces of the BBC model B. Research Machines seems to have done the utmost to ensure all the knowledge and experience people had acquired using BBC Basic on the BBC micro could be reinvested with the Nimbus.

The BBC 's function keys are no real trouble as the Nimbus also has 10 of its own (although they are numbered 1 to 10). The compromise is that the Nimbus function key 10 carries out whatever the BBC function 0 did.

There are some differences between the emulation and the 'real thing' but nearly all the BBC Basic keywords can be used in *Nimbus BBC Basic86*. Some 40 are listed as working slightly differently.

The BBC Basic interpreter recognizes and acts on most of the familar BBC star commands but, once again, not everything has been emulated. There are, however, some alternative commands available to do the same things as some of the missing commands.

For example there is no *BACKUP command but *DISKCOPY is included and

this does the same thing.

All eight BBC screen modes are available on the Nimbus, although six physical scan lines are missing from some screen displays. The 16 colours (eight solid, eight flashing) of the BBC micro are emulated as the default colour range but the 16 solid colours of the Nimbus are also available.

Any program which relies on BBC hardware will not normally run at all and BBC software that uses PEEKS and POKES will not run either. However, in some cases you can replace some POKES with the equivalent 'legal' command.

Another problem is that BBC based machine code programs or routines written in 6502 assembler will not run on the Nimbus. However, a 8086/8088 assembler is included.

Despite these problems, RML's emulation of the BBC micro has great possibilities. A good range of low level operating system commands have been implemented and I was impressed by the fact that a number of the Nimbus's own features were available.

The BBC Basic compatibility handbook accompanying the package is outstanding. All possible problems are decribed and useful guidance given.

The easiest way to get your BBC programs into a Nimbus is to use serial links. This possible way of transferring programs is fully discussed in the handbook and it is basically a question of connecting the Nimbus and the BBC micro's serial ports with simple Basic programs running in each micro.

Once transferred the programs can be converted. The conversion process is not too problematical and is usually a question of translating their tokenized format to that understood by *BBC Basic(86)*.

With *Nimbus BBC Basic(86)* running, the RM Nimbus provides an environment remarkably similar to that of a real BBC micro.


The Cambridge Computer Z88

PC compatibles

Over the last couple of years M-Tech has released a number of versions of BBC Basic for use with the IBM PC range or their compatibles. *PC Compatible BBC Basic(86) Plus* is the latest.

The software is supplied on single 360K disc with over 500 pages of documentation in an A5 ring binder.

Two actual variants of *BBC Basic(86)* are available, *BBCBasic* and *BigBasic*. The main difference between these variants is that *BigBasic* allows the variable storage area to exceed 64K. With this variant of BBC Basic a program can store and manipulate in memory an amount of data limited only by the Ram capacity of the machine and the MS-Dos limit of 640K.

BBCBasic is a better choice if you do not require more than 64K for program and data space as *BigBasic* is not 100 percent compatible and has some minor drawbacks like a slower speed. In addition it uses more code and data memory than *BBCBasic* for the same Basic program.

When it comes to graphics and colours *PC Compatible BBC Basic(86) Plus* provides support for the MDA, CGA and EGA, plus some limited support for the VGA. None of the PC display formats available with any of the display adapters offers identical resolution to the BBC micro and so complete compatibility is not possible.

However to make *BBCBasic(86)* as compatible as possible with the BBC micro the number of basic modes has been kept to eight and the original BBC modes have been mapped on to the PC mode with the closest attribute match. Mode 7 is available if either an EGA or VGA is fitted with an EGA (or VGA) monitor.

A number of useful utilities are provided on the distribution disc to assist in the transfer of files from the BBC micro to the PC. The first, FCONVERT.BBC converts programs and some data files to *BBCBasic(86)* format. But before converting files you will need to transfer them from your BBC micro formatted discs to MS-Dos discs.

This just requires a lead from the BBC RS432 port to one of the serial ports on the IBM or compatible. The M-Tech manual gives the necessary wiring diagram.

The distribution disc contains both the Beeb and PC transfer programs to effect the transfer. A further program converts from tokenized BBC format to *BBC-Basic(86)* format.

PC Compatible BBCBasic(86) Plus does provide a high degree of source program and operational capacity with the BBC micro's Basic 2 and Basic 4.

If you want to run BBC programs without assembler codes and with limited graphics capability it's fine. Some datafiles can be a problem, especially if they have been written using BPUT# rather than PRINT#, but don't expect a high standard of emulation. As a programming language to run under MS-Dos this is an outstanding package.

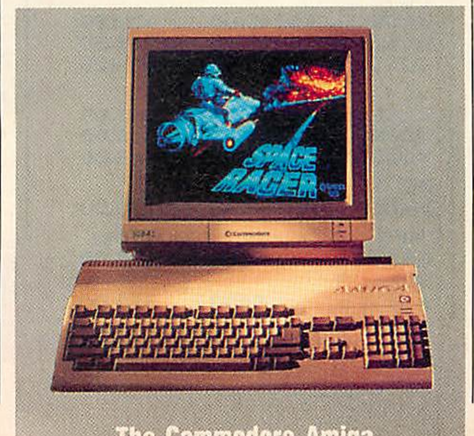
Richard Russell, author of *BBC Basic(86)*, also wrote the version of Basic supplied with the Acorn Z80 second processor. As some people will know he is the author of the BBC Basic language built into the diminutive Cambridge Computer Z88 portable.

Richard Russell also developed a version of BBC Basic to run on the Acorn 80186 co-processor and anyone with a BBC Master 512 or a BBC model B with a 512 board will be pleased to know that this is a 'freeware' version of BBC Basic, as Acorn decided not to take up the 'special' version of BBC Basic that Richard wrote for the 512. The '512 version of BBC Basic' runs under Dos Plus and provides real access to all the BBC screen modes including mode 7.

Mac to Beeb

There are a growing number of Apple Macintosh computers finding their way into schools and colleges. Thanks to the tremendous efforts of Human Computer Interface, the Mac can emulate the BBC micro in almost every way. HCI has developed the emulation concept so much that schools can easily have BBC micros working alongside Macintoshes as equal partners with little or no problem.

Human Computer Interface initially developed BBC Basic for the Macintosh in 1987. This takes full advantage of the power of the Macintosh to provide an ideal environment for developing and



The Commodore Amiga

running programs in Basic. Many commands can be given from menus as an alternative to typing them in, and the editor allows you to write and edit programs using the mouse and the familar Mac cut, copy and paste.

Mac BBC Basic includes a built-in interface to transfer programs to and from a BBC micro without additional software. Just a cable is needed.

Version 2 of HCI's BBC Basic was released this year and took these ideas much further. As well as supporting the full BBC Basic language, it incorporated some significiant features of the Archimedes Basic V. The uprated package also includes a 6502 assembler and an integral interpreter.

More significantly, Version 2 incorporates *The BBC microcomputer Emulator Operating System* (BEOS). This implements most BBC micro operating system calls to cater for Basic and machine code programs using OS routines. A wide range of star commands is also supported. It is possible to totally emulate the BBC micro on a standard Macintosh computer.

All the BBC micro and Master 128 text and graphics screen modes are simulated including the teletext mode with separated and contiguous graphics and double height characters. It also provides an additional mode, ideal for developing programs solely for use on the Macintosh. Colour is even supported on the Macintosh II in the colour modes, including flashing colours (but not in mode 7).

The sound emulation provides a close approximation to the sound capabilities on the BBC with four channel sound with envelopes supported.

Unlike the IBM PC the Apple Mac does not have function keys but the emulator still manages to implement them using the numeric keypad numbers.

Amazingly, Macintosh BBC Basic runs most programs faster than the native Acorn implementation on the model B or Master 128, in some cases programs can run twice as fast, and the entire Macintosh memory is available for programs and development.

There are three other HCI products of interest to anyone with access to BBCs and Macs. *BBC>>Mac* is primarily designed to provide a direct link between BBC micros on an Econet filing systems and a Macintosh on AppleTalk. Files can be exchanged between the BBC file server and the Macintosh with the file server treated like an external Mac drive.

Screen>>Mac transfers bit-mapped screen images and graphics between the two machines and *View>>Mac* transfers text document files between *Macwrite* and *View*, *View Professional*, *Wordwise Plus* and Computer Concepts' *Interword*.

The Amiga

The Emulator was developed by James Associates and Commodore to give the Commodore Amiga the appearance of running a BBC model B with Basic 2 and DFS in Rom.

It runs as a process on its own screen within the Amiga multi-tasking operating system so other Amiga programs such as editors and utilities can be run at the same time.

Existing BBC Basic programs or 6502 assembler can be run on the Amiga without any degradation of the Amiga's native advantages such as split screens and multi-tasking.

The Emulator runs nearly all 'legal' BBC software using Basic and the OS. It will certainly not run 'illegal' programs which bypass the OS, such as most commercial BBC arcade games. But if you aim your sights a little lower, it provides access to about 200 educational programs.

The emulator provides a totally new implementation of BBC Basic. This has been recoded from scratch in 68000 assembler. According to the publishers it is 'as compatible as possible' with BBC Basic 2. The package also includes an emulation of the 6502 central processor for 6502 assembler routines.

A wide range of BBC Basic keywords are available. A few omissions will be noticed but programs still usually run. Around 60K of Basic workspace is available to the user.

All the BBC screen modes are supported, but in mode 2 and 5 the horizontal resolution is actually double the original.



The Apple Macintosh

Mode 7 is slow under *The Emulator* but it's normally fast enough for all practical purposes.

The differences between the keyboards are sorted out reasonably well with several rather strange substitutions of Amiga-specific keys for the unusual Beeb ones. Even key repeat delays can be altered as normal with *FX11 and *FX12.

Transferring programs and files across a serial link has been well thought out. *The Emulator* contains a set of special star commands for file transfer.

Once you have your BBC programs on an Amiga disc you have access to a curiously named 'Disk Furtling System' which allows an Amiga directory to appear to the emulator as a complete DFS disc. The normal Acorn 31 files limit is increased to 63 but it is possible to fill an entire Amiga disc with as many DFS drawers as you like to fill up the capacity of the disc.

Although *BACKUP, *DESTROY and *WIPE are supported, individual DFS drawers can be copied or deleted by 'dragging' the drive icon.

Conclusions

A software emulation of another computer's hardware will never be a perfect solution.

Some of these emulators are certainly a compromise. Although they contain good implementations of BBC Basic they do not really emulate the Beeb. However, others are outstanding and go the full distance to provide virtually everything to enable most programs to run as if a BBC micro was hidden inside the new micro's case.

Both 65Host *and* 65Tube *for the Archimedes are supplied with Risc OS from Acorn Computer, Fulbourne Road, Cherry Hinton, Cambridge, CB1 4JN.*

Nimbus PC BBCBasic (86) *costs £29 from Research Machines, Mill Street, Oxford OX2 0BW.*

PC BBCBasic (86) Plus *for the IBM PC or compatibles costs £96.60 and is available from M-TECH Computer Services, The Market Place, Reepham, Norfolk NR10 4JJ.*

BBC Basic Programming language and Emulator *for the Apple Macintosh costs £149,* BBC-Mac *costs £95 and* BBC Emulator *costs £39 from Human Computer Interface, 25 City Road, Cambridge CB1 1DP.*

The Emulator *for the Commodore Amiga costs £39.95 from James Associates Ltd, Hazlitt Mews, London, W14 0JZ.*

CLOSE TO THE EDIT

At last, Electron users can do some serious Basic editing with the help of Pres' new package says Bernard Emblem

BBC Basic has many sophisticated editing facilities not found in other variations of the language. Since 1985, model B owners have been able to add even more features by purchasing Acornsoft's *Basic Editor*, a Rom later bundled with the Master.

Now at last, these facilities, and more, are available to Electron users too, on Pres' 32K *Advanced Basic Editor* Rom (which, incidentally, will also run on the Model B and Master).

Supplied as a bare Rom to plug into a cartridge, AP6 or Slogger Rombox, or complete within its own cartridge, the *Advanced Basic Editor* will prove to be an invaluable tool for all Electron programmers.

A Basic editor effectively gives you wordprocessing features when you're programming. The command *BE (yes, I'm very flattered they called it after me) calls up a command screen which displays the size of the program (if any) in memory, the amount of memory free and the current mode which is mode 6 by default on the Electron.

Typing HELP while in this command mode displays a list of available commands. INFO gives useful information about the program, such as its name and the current tab, colour, scroll settings and so forth. *VLIST lists all variable names and their current values, and the line numbers of procedures and functions.

Just like a wordprocessor, ESCAPE takes you to an editing screen, where the current program in memory is displayed, ready for editing.

Electron programmers will be disappointed to discover the machine's valuable keyword facility is not available in this mode, as new editing functions have been assigned. However, the new key values have been carefully thought out – f-R for renumber, f-F to change foreground colour, f-M to scroll through the modes and so on, making the new commands easy to learn.

It is also possible, of course, to write a program in Basic using the old keys, then edit it in the *Advanced Basic Editor* using the new facilities.

Numerous other familiar wordprocessing features are implemented, such as the ability to jump to the top or bottom of a program (f-A and f-Z), to toggle between insert and overtype (f-I) and to split or join statements (f-S and f-J).

Statements can also be marked to make them easier to find and blocks can be marked and then be either moved, copied or deleted.

Sophisticated search and replace facilities are among the editor's most powerful features. FIND will find all occurrences of a given string.

EDIT will place the cursor on each line containing the string, ready for editing.

CHANGE performs an unconditional change but needs to be used carefully. CHANGE S$ ANTIQUE$, for example, would not only change every isolated s$ to ANTIQUE$, but also change ACORNS$ to ACORNANTIQUE$.

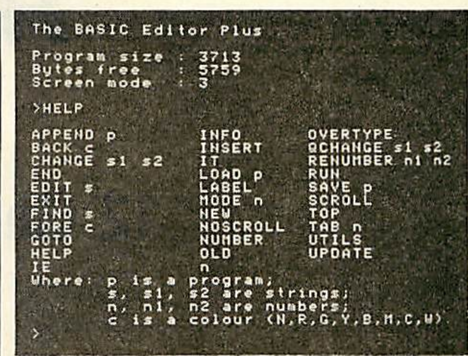
For this reason, a qualified change QCHANGE command is available, which produces a (Y/N) prompt before each potential change.

In addition to the existing automatic line numbering and the global renumbering facility, pressing RETURN when in the editor automatically creates a new numbered line, and partial renumbering is now available.

It's always been possible to write programs with the aid of useful functions and procedures kept in a library and used when needed but merging these routines into programs is normally a messy business, involving unfriendly commands and with great care needed over line numbers and so on.

The *Advanced Basic Editor*'s APPEND command performs an 'intelligent' merge. If there is an overlap of line numbers, for example, the resulting program will be automatically renumbered.

If the new program happens to be too large, the editor will then reset the computer to the most economical mode (normally mode 6 on the Electron). If there is still too little memory available, an error message will be displayed and the original program will be restored.



How have you survived without it?

Memory problems can also be approached with the use of PACK, which is used to reduce the amount of memory occupied by a program by up to five techniques, each of which the user is prompted to select or not.

They are the removal of REM statements, spaces and assembler comments, the shortening of variable names according to a number of rules and by joining short program lines.

Unpacking does not restore REMS, comments, or full variable names. It does however, put each statement on a new line, and it also inserts spaces for screen editing.

It is also possible to use the editor to try to recover 'bad' programs, though success is, naturally, not guaranteed.

Excellent software is often ruined by poor documentation but Pres has managed to provide a very comprehensive manual with plenty of examples for those of you new to this kind of thing, together with extensive appendices and a comprehensive index.

This Basic editor isn't cheap but for anyone who aspires to more than dabbling either in Basic or assembly programming, it will save hours of frustration, and will probably lead to a lot better written programs.

I can recommend this package unreservedly. You'll wonder how you ever managed without it.

Advanced Basic Editor *£28.69 (Rom) £36.80 (cartridge version) from Pres, PO Box 319, Lightwater, Surrey GU18 5PW. Tel: (0276) 72046.*

PLOTTING ALONG

Dave Futcher draws his conclusions on the latest data presentation package from Minerva

Minerva Software already has one impressive piece of graphing software called *Gammaplot*, released some nine months ago. Now there's another, *GraphBox* which is also subtitled 'The Risc OS Data Presentation System'.

GraphBox only makes some use of Risc OS. You can run another program while using it and it integrates with other applications but it doesn't install on the icon bar.

It would seem the days of wrestling with a calculator and graph paper are over. With *GraphBox*, highly professional graphs can be produced in minutes. Plotting graphs for any purpose whether scientific, commercial or educational can easily be achieved.

The software is provided on one 3.5in disc. Like most Minerva packages the disc can be backed up but the original must be used as a sort of key.

As well as the main programs, the disc contains 15 demonstration files.

Creating a graph

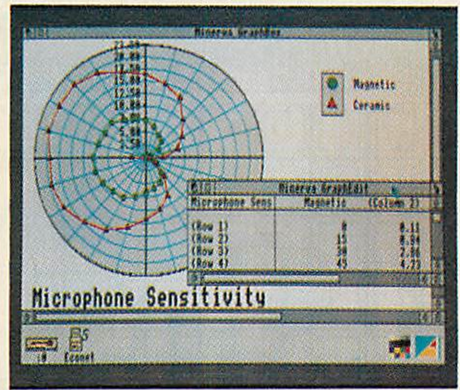
GraphBox has its own data entry and edit utility called GraphEdit which allows data to be entered, saved and displayed as a chosen graph. This has the familar layout of rows and columns which resembles that of a spreadsheet.

But *GraphBox* will also allow data to be imported from other applications, but only so long as the file is a CSV (Comma Separated Value), TSV (Tab Separated Value) or Ascii. This limits the range of applications which can be dropped into *GraphBox* with ease.

The problem is that imported data cannot be labelled from within *GraphBox* nor edited at all, so only if the data source conforms exactly to the *GraphBox* format can it be used fully.

Displaying graphs

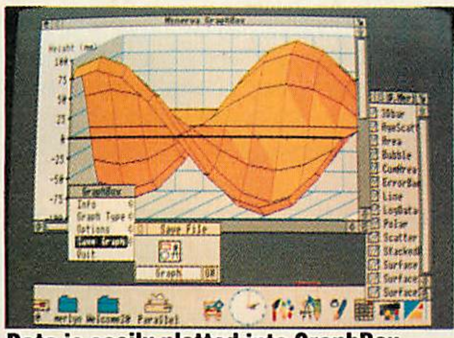
Displaying already created graphs is so easy. With *GraphBox* loaded, you double click the GraphData icon to display the graph files available and then drag the one you want to the *GraphBox* window. In a short space of time the graph is displayed.



GraphBox comes complete with edit utility



There's a range of 20 styles of graph



Data is easily plotted into GraphBox

The package has a comprehensive range of graph types available. The list of 20 ranges from a straightforward bar chart to a polar graph.

The most suitable type of graph for any set of data can be chosen to provide the best display for the data or to reveal different information.

Good examples of this are a 'Stacked Bar Chart' which will show totals of a data set, or a 'Percentage Bar Chart' which will convert the data into percentages.

Usefully, the graph types are not stored. It is merely a matter of selecting types required and *GraphBox* will try to make sense of the data even if it is not correct for that graph type.

Having selected and displayed a graph you can decide to change the way it is displayed in some way. *GraphBox* allows such changes to be made and displayed very quickly.

For example, you can remove markings for the X or Y co-ordinates. Other options include removing the grey background or presenting the whole of the display in monochrome. Selecting Key will toggle the key and the text next to it on and off.

Printing

Multi-tasking applications can now use the same printer drivers and save on the compatibility problems that have caused problems with printers in the past. The Archimedes applications disc contains PrinterDM which will drive most common standard dot-matrix printers.

This will be alright as long as you're sure your machine has enough memory to load both *Draw* and PrinterDM – some 320K altogether.

Conclusion

The program has a considerable amount to offer an Arc user. Its implementation under Risc OS means data can be imported from other multi-tasking packages and the resulting graph simply exported to disc or printer.

Importing data from other sources is more difficult and putting more than one graph on a screen requires *Draw*. Nor is it possible to carry out extensive editing on a graph.

However, *GraphBox* is certainly an outstanding data presentation package. Professional looking graphs can be produced in a matter of minutes whether you require a simple scatter diagram or a complex polar graph.

GraphBox *costs £79.95 from Minerva Software, 69 Sidwell Street, Exeter, Devon EX4 6PH. Tel: (0392) 421762.*

GAMES

Pipeline is an intriguing little game which seems to be based on the old Beeb game *Confusion.*

Basically you are given two sets of building blocks by the use of which you construct a pathway through which a 'spark' flows until the path ends.

The screen is divided into squares, into which you may place the blocks. A block can contain a straight, a curve or a crossroad. Blocks can be taken from any of two sets, positioned on the left and right of the screen. Each set is shown as a stack of blocks, and the player can only take a block from the 'top'.

The gamer places a highlighted square on the grid which specifies the position of the block. Once set, the player can then select from which of the two stacks a block is to be taken. When taken, the stack scrolls to allow another block to be slotted in at the bottom.

If the player can make a pathway which uses more blocks consecutively from one set before having to change to the other set, the score will be increased appropriately.

There's a built-in timer, so you haven't got all day to figure the puzzle out and as a result the action can get quite hectic at times.

In later levels, the time allowed decreases and some objects become totally invisible.

The functional graphics and sound combined with the strategic element create a thoroughly enjoyable and playable game.

Richard Browning

Pipeline. Empire, BBC model B, B+, Electron, Master 128, Compact. £9.95 (cass), £11.95 (5.25in disc) £14.95 (3.5in disc).

Literally overnight comes news of a game under development for two and a half years. The Fourth Dimension has made quite an 'impact' on the software scene and fast become one of the front-runners in the Acorn games league.

The latest release sounds remarkably like *Elite* underwater. It is set in the distant future when all surface life has ended due to the build-up of green-house gases.

After the summer we've just had, this will probably be next year! Anyway, it becomes unbearably hot so the population of Earth has put evolution in reverse and returned to the cool seas.

The new civilisation has created 'highly advanced' submarine craft and (guess what?) they all hate each other. Different cultures have created different battle-subs and the plot begins to expand like *Elite* with underwater confrontations, commodity dealing, currency exchange and bounty hunting.

The object is to locate the Ultra Intelligent Machine which has an answer for every question and a question for every answer (sounds like a politician).

The bad news is unexpanded Beebs are not going to be seeing a lot of this game but, as always an Archimedes version will be along a little later – Christmas time.

Alien Images, the games label for Dabs Press, has exploded forth with games for the Christmas Market. As well as *All-in Boxing* reviewed on the right, comes news of further releases.

First up comes a *Space Invaders* for the Arc! *Alien Invasion* comprises 1000 waves, various backdrops and a full sprite editor which allows characters, characteristics and wave formations to be defined.

It seems a funny game for the Archimedes but who am I to judge before I've seen it? Like *All-in Boxing*, *Alien Invasion* is to be sold for £14.95.

Finally from Dabs this month is the long awaited *Aliped* which I first mentioned over a year ago.

The game is totally mouse driven and comes in the same mould as Minerva's *ThunderMonk.* It's also similar to the Atari *Dark Castle* – both are set in castles with similar objectives.

However, the puzzles are different in style, so watch for this in October.

You'll either love or hate this: at the request of high street retailers WH Smith, Superior has been pursuaded to continue the *Play it Again Sam* series.

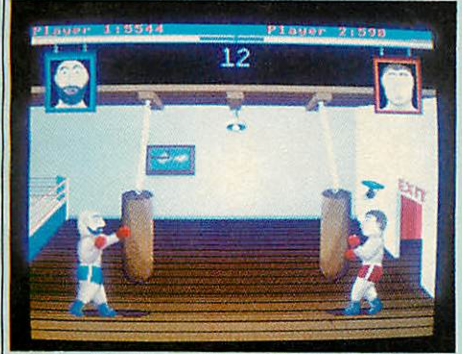
I suppose there's nothing wrong with them – four games for the price of one is surely good value (and the name's good too!) but I wish they'd inject more effort into some 'mega games'. I guess it's a question of giving the punters what they want.

Anyhow, the next 'proper' Superior game will be called *Ricochet* and despite containing 240 different screens, it offers little new. There's nothing wrong with it but it uses the well-used formula of *Citadel*, *Palace of Magic* and the like, and experience shows this rarely fails.

Come on software houses. Take some risks. Live a little! **Sam Greenhill**

The first boxing game for the Archimedes is a good one. *All-in Boxing* features nice large animated sprites, good sampled speech and sound and a set of well matched boxers.

The game is one or two player and as usual each has to spend some time experimenting with the keys before the



All-in Boxing, Alien Images. £14.85 Archimedes Only

fight begins. You battle your way through the tournaments, gaining a higher and higher rank and building up from amateur to professional.

As in most boxing simulations the energy bar at the top determines a players health but in *All-in Boxing* there is more to this. Just as in real boxing your body gains energy between rounds, in the game you must alternately hit a punch-bag and do some skipping to build up your power.

Of course you so you must go as fast as possible without tripping over the rope or being winded by the bag.

The boxing is also good but can become a little tedious as probably the best method is to repeatedly body-punch your opponent into exhaustion. Then the referee begins while counting while you must thump the Z and X keys Tynesoft-style to regain vital energy.

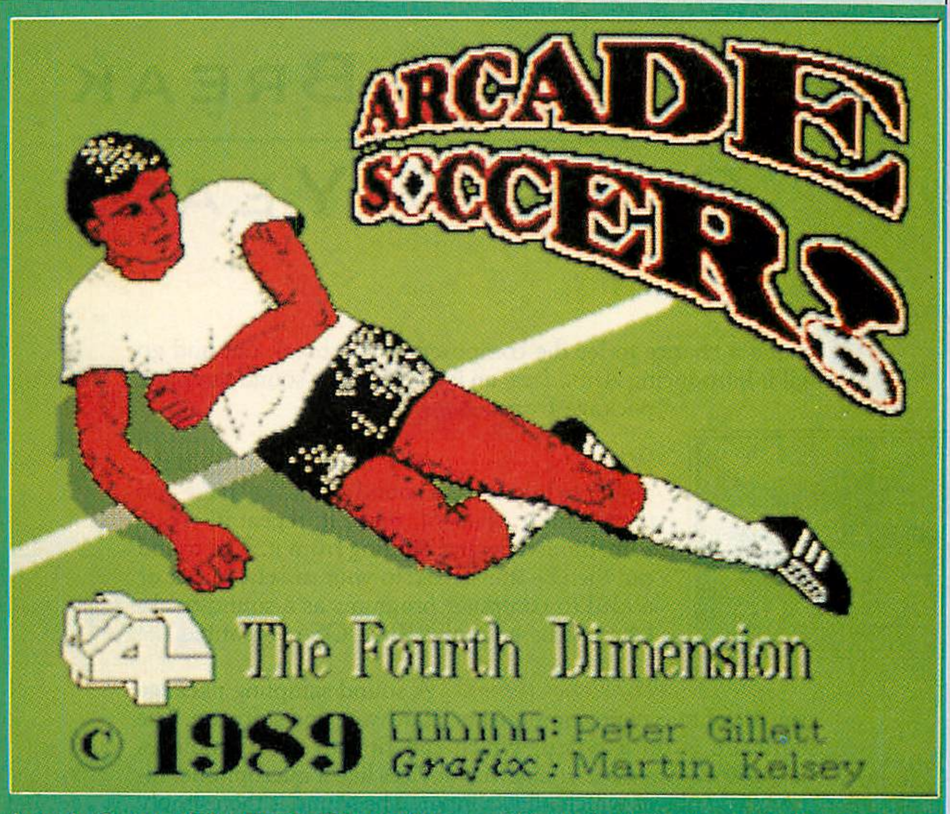
Even when you do stagger up, there is little to do but be knocked down again, so effectively its the first to falter in the first place that loses the round.

The graphics and sound have a lot of attention given to them but the strategy routines could do with a little brushing up, having said that it's probably the best routine I've seen yet.

More manoeuvers are also required to give it a better feel to the game and the crowd could perhaps display a bit more enthusiasm. But at the end of the day *All-in Boxing* deserves merit for a brave attempt at expanding the 'conventional' boxing simulation.

This is a very good game, it would make an excellent Christmas present.

Sam Greenhill



Arcade Soccer. The Forth Dimension, BBC model B, B+, Master, Compact. £9.95 (cass), £12.95 (5.25in disc) £13.95 (3.5in disc).

Many football simulations of one sort or another have come and gone but I think this one rises above the rest, not least because of the two tunes that alternate with loading.

The game has one excellent feature – it can cope with up to 24 players, each with their own team and country.

Many options are included to mould game-play to personal requirements, such as the skill of the goalie, speed of play and the length of each half.

Human can play against human or computer and a whole league is automatically set up, again depending on how the options are set.

There is even a 'friendly' mode, in which any team can play any other without feeling the need for immense professional effort.

The game itself employs some good ideas. The scrolling is virtually flicker-free and this allows the game-play to 'feel' smooth.

However, there is one bad point: during kick-off and corners, the computer players seem to wander all over the place and some even walk through goal posts!

The game has a default time limit of one minute per half but it is possible to expand this to five.

Overall the game is remarkably realistic and it includes nice throw-ins, corners and good action but I get the feeling it lacks something.

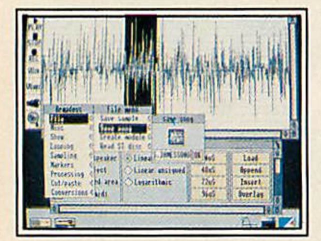
Nevertheless, I'd still recommend it to any football fan, particularly if you find a group of friends to join the league. It's good fun. **Mark Elmer**





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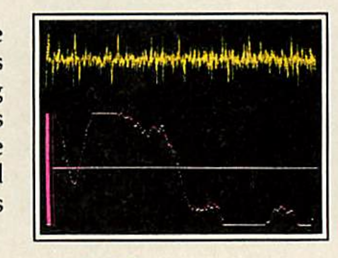
Here's a chance to let the composer in you break out and go wild. Introducing *Armadeus*, an incredible new sound sampling package from Clares.



What is sound sampling? Sound sampling is the ability to take a basic sound or musical piece and then bend it, shape it, move it, repeat it, create something new and exciting from it. The sound can then be transferred to your cassette player or added to computer programs as a sound track. (*Armadeus* is totally RISC OS compatible.)

How does it work? A sound sampling package consists of two main components. Hardware and software. The hardware is on a board, which can fit into an Archimedes backplane. There we fit external devices like a microphone, hi-fi or a CD player which allows input. The sound is then simply imported into the computer, and that's all there is to it.

What is sound sampling useful for? There are many varied uses. Sound sampling is professionally used in recording studios. Analysing musical characters and pieces, allowing various parts to be recognised and changed. And more commonly, it's used for fun, creating wild and whacky noises, or sound tracks for home videos and computer programs.



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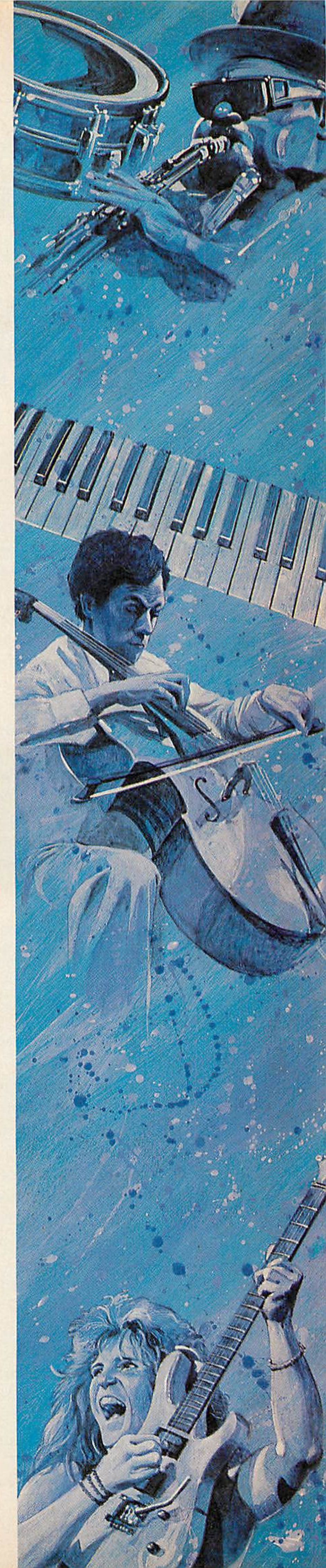
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MARVELLOUS MIDI

If it's control over your instruments you're after – then Rick Cocker thinks you should look at the Music 2000 from Hybrid

There are a number of MIDI interfaces available for the BBC micro. All have been on sale for some time but Hybrid Technology's Music 2000 is the most remarkable as it is the only computer-based music system.

That is, it's not simply a device to manipulate MIDI data but has at its heart the programming language, Ample, which affords tremendous compositional control and power.

The Music 2000 is designed only for existing owners of at least some of the Hybrid Music System (the Music 5000 Synthesiser, Music 4000 keyboard, Music 1000 amplifier and Ample Rom).

Looking like the Music 5000, the 2000 is equipped with three MIDI out sockets and one MIDI in. LEDs on the front signal MIDI data is being transmitted.

The 2000 is plugged into the 5000's 1MHz extension socket and the M2 module installed from the disc supplied.

The new module provides a number of new Ample words:

MIDIBEND
MIDICHANNEL
MIDICHPRESSURE
MIDICONTROL
MIDILINE
MIDIOUT
MIDIPRESSURE
MIDIPROGRAM
MIDIRT
MIDIV
MIDIWOUT

The existing Ample words, GATE, PITCH and VEL are also used with MIDI. As with all Ample structures, the word forms the basic building block leading to larger control structures.

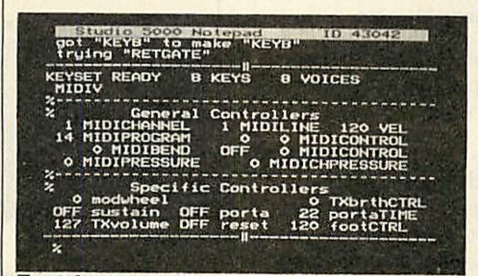
Nine parts are available each having up to 12 voices, either MIDI or 5000, 32 voices in total. Free mixing of MIDI and 5000 voices is one source of the system's creativity and power.

In use

Entering music for MIDI is as before, except the mixing desk does not support MIDI voices. A separate mix word must be defined and added to your PLAY structure. Synchronizing a sequencer/drum machine to the 2000 is easy and drum patterns can be programmed within Ample using the hit word.



The only computer-based music system



Test instrument response while playing

One disappointment with the 2000 is the lack of software support for the MIDI in. So, only the Music 4000 can be used as a keyboard, without the modulation and dynamic control found on most synths.

However, many people opting for computer-based music are not necessarily keyboard players anyway. Composition is often the major interest and it is here that Ample scores. Also, pressure, pitchbend and so forth can all be added on playback. So you can add rallentandos, accelerandos and (in addition to most sequencers) fermata. The dynamic level can be 'borrowed' to execute, say, breath control on a DX synth. A joystick can be used to give further modulation control. MIDIOUT (send one MIDI byte) and MIDIWOUT (send a MIDI word) come into their own for this.

More interesting is the use of system-exclusive messages to control the parts other sequencers cannot reach. The more MIDI literate you become, the more you find for the 2000 to control.

Add to this the programming structures Ample offers such as random, IF...THEN, transposition, looping and so on, and you begin to see the power within.

Voices are placed on the keyboard in a similar way to the 5000 voices. The Recorder section requires MIDI instruments to be defined along with a MIDI mix to play MIDI parts.

Control screens can be set up (see the screen picture) to fully test your MIDI instrument's response while playing the keyboard. All these words can be defined to suit your own setup and saved to disc as an EXEC file and brought in as required or saved as a normal program, added to the boot and made available on start-up.

In conclusion

If viewed solely as a MIDI sequencer (lacking dynamic control for real-time input) the Music 2000 is certainly not as viable as other systems.

However, at a purely MIDI level, the ability to program your own system-exclusive control words makes the Hybrid system extremely versatile. The 2000 should be seen as an extension of the Ample language not simply as a computer-based MIDI sequencer.

The Music 2000 offers great compositional power, with the ability to create your own working environment. The experienced Ample programmer will find they have more control over slaved MIDI instruments than almost any other computer-based system.

Music 2000 *£161 from Hybrid Technology, 273 The Science Park, Cambridge CB4 4WE. Tel: (0223) 420360*

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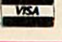
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KEEPING UP THE IMAGE

Keeping track of the Greenhill library's quarter of a million photos was a fearsome task. Steve Mansfield found out how Acorn micros saved the day

When people enter the Greenhill Library in Islington they are not looking for books. This is because Sally and Richard Greenhill are photographers. Stock photography is a booming business. The pictures are loaned to newspapers, magazines and publishers. The library charges a reproduction fee and the pictures are returned to be used again.



It's not books, but photos, in this library

In 1971 Sally and Richard, both experienced commissioned photographers, returned from a trip to China with several thousand pictures. These gave them a chance to get into stock photography.

Over the next eight years, their work shifted from shooting commissioned photographs to selling stock shots. Another major trip to the US in 1979 boosted the size of the stock and they decided to formally set up the library.

Although the content of the library has largely remained the same, the level of business has soared.

In a typical day, around 80 photographs will be sorted and sent out. It can be as much as 120 and around the same number will be coming back in.

Finding the right pictures for the job, logging them in and out, producing delivery and return notes, and writing out invoices for delivery and search fees all took a vast amount of time when it was done by hand. The Greenhills have been lucky in having the services of librarian Sally Neal. But the paperwork needed another solution.

The obvious answer was to computerise but there were no systems around to handle this kind of job which didn't require an army of support staff and programmers. The solution would have to be home-brewed.

Richard ordered his BBC micro in 1982. Although he is an unrepentant gadget fiend, the Beeb had a serious purpose – to make the library more efficient. With a little free help from a professional programmer, Richard outlined what the computer had to do, then rolled up his sleeves and got busy.

'The software was not going to be an index of pictures. Our pictures are too hard to describe,' said Richard, 'and there are too many ways to categorise them.'

The main job would be stock control and they decided to add bar codes to all their pictures. 'To do this without bar codes would not have been a big enough benefit.' Richard explained.

In those early days of the Beeb there was no database program available so Richard had to write his own, learning as he went the joys and tribulations of random access and serial files.

Eventually Richard introduced the computer into the library for several months of fine tuning and debugging. The software was heavily disc intensive and disc faults were a problem. There was also a snag with the bar codes – there simply wasn't enough room on a 35mm transparency mount for all the digits of the picture code and a tortuous encoding system had to be evolved.

Eventually the problems were sorted and the computer began to earn its keep.

With the bar code reader, picture codes are scanned quickly. Delivery and return notes are produced automatically and the library now has a tool for analysing the business – how many pictures are on loan to a particular client, how many are being sent out in a given time, and so on.

There were still problems. As business increased, the BBC micro began to creak at the seams. Disc space and the 256K maximum file size became limiting. Something was needed to boost performance ... the Archimedes arrived.

The changeover was to be fraught with problems. The different disc formats didn't help. To make matters worse, Richard had opted for a non-standard Beeb DFS. Eventually the software was transferred byte-by-byte through the serial ports.

The Arc introduced many benefits. The first was speed. The hard disc on the library Arc 440 accelerated searching and permitted larger files. The graphics allowed Richard to write software more comfortable on the eye and the programming environment is more efficient.

The most important benefit is a better service to the library customers, often supplying pictures within minutes. Also, with pictures being the stock, for clients to lose copies is somewhat undesirable. Under the old manual system, there was always the chance the delivery note was wrong. Now the library can say with confidence a client has a certain photograph – important when you're charging around £400 a time.

There are exciting possibilities for the future too. Multi-tasking under Risc OS will make the library more efficient still.

Much of the software is being rewritten using packages such as *System Delta Plus* and *Archway* to take some of the pain out of programming.

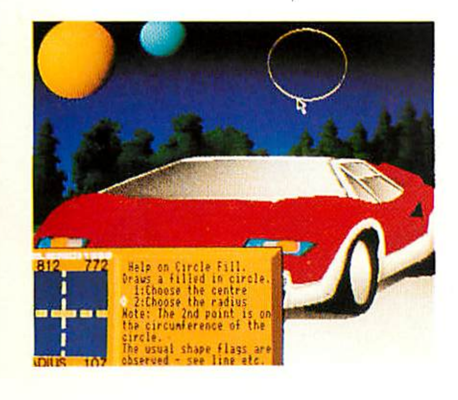
There are other plans in the pipeline. The library is looking into digitising pictures to form a video database of the stock. This could be used to make a quick search. Picture roughs could be faxed for approval direct from the computer.

Richard has little hesitation singing the praises of his system. 'When things have gone wrong from time to time I've thought "This is crazy". But it has certainly been worth it in the end.'

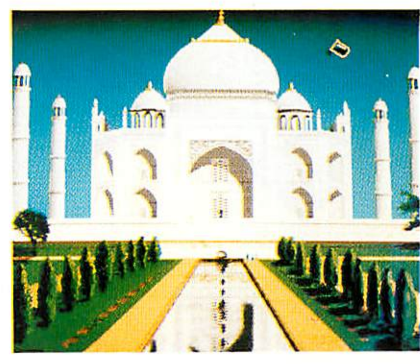
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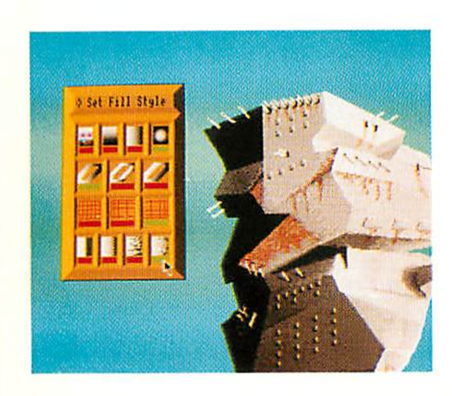
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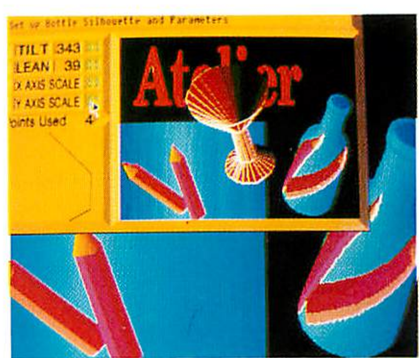












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